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Rising BRICs and Changes in Sub-Saharan Africa's Business Cycle Patterns

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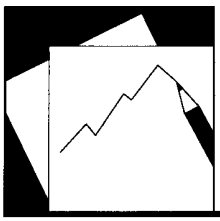

IMF Working Paper

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Oumar Diallo
Sampawende J.-A. Tapsoba

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Rising BRICs and Changes in Sub-Saharan Africa's Business Cycle Patterns

Prepared by Oumar Diallo and Sampawende J.-A. Tapsoba[1]

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Abstract

This paper assesses the extent to which Sub-Saharan Africa (SSA)'s business cycle is synchronized with that of the rest of the world (RoW). Findings suggest that SSA's business cycle has not only moved in the same direction as that of the RoW, but has also gradually drifted away from the G7 in favour of the BRICs. Trade with the BRICs turns out to be the strongest driver of this shift. Much of this impact unfolds through aggregate demand impulse from trade. As fiscal policy stances in SSA and the BRICs are not synchronized, they have not caused cyclical output correlation between these two groups of countries. Also, financial openness, which is at a very early stage across most SSA countries, has acted as a neutral force.

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I. INTRODUCTION

The growing economic prominence of Brazil, Russia, India and China, known as the BRICs, is one of the major forces shaping the global economy. This rise has manifested itself through stronger trade and financial ties with the rest of the world (RoW), including with sub-Saharan Africa (SSA). As they gained strength economically, the BRICs have become not only key markets for SSA exports and imports but also financiers, investors, and donors, therefore acting as important growth powerhouses. Not surprisingly, the impressive commodity-driven growth sustained during much of the last decade has been attributable in part to the growing economic dynamism of the BRICs. Such a development suggests that output correlation between SSA and the BRICs has risen recently.

This development is important at least on two counts. First, a greater business cycle synchronization, henceforth referred to as *BCS*, implies that SSA countries are now more vulnerable to shocks from the BRICs, therefore pointing to the need for SSA policymakers to pay greater attention to developments in the BRICs. Second, a stronger *BCS* also suggests that SSA's course toward strong and sustainable growth and its efforts to diversify away from primary commodities might be shaped by the pace and sustainability of growth in the BRICs and their bilateral trade patterns.

Although the issue of output synchronization is both relevant and timely, especially given the prospects of a further rise of the BRICs' share in the global economy and the intensification of their trade and financial relations with SSA, no study has hitherto explored this. The few existing studies on the relations between SSA and some BRICs, in particular China, analyse constraints and policy challenges (Broadman 2007) or potential gains and losses associated with increasing trade flows between these two trading groups (Kennan and Stevens 2005; Jenkins and Edwards 2006). Ademola, Bankole, and Adewuyi (2009) assess features of increased bilateral trade links between China and Africa and find the gainers across Africa to be natural resources exporters. Drummond and Liu (2013) analyse the impact of changes in China's investment growth on SSA's exports and observe that such an effect is strong, particularly for resource-rich countries. The paper that comes closest to ours is the piece by Samake and Yang (2011), which explores business synchronization between the BRICs and low-income countries (LICs). But they do not focus on the drivers of SSA's business cycle synchronization. To the best of our knowledge, our paper is therefore the first attempt to explicitly investigate the impact of growing trade flows between SSA and the RoW on *BCS* with an emphasis on the BRICs.

The purpose of this paper is threefold. First is to shed light on the possible synchronization of SSA's business cycles with those of various partners and identify whether there has been a shift toward the BRICs. Second is to identify the driving factors behind this development. Third is to draw relevant policy implications.

To respond to these questions, we compute a measure of synchronicity—using the coefficients of correlation between the cyclical outputs of SSA countries and those of their trading partners—and analyse synchronicity trends across time and groups of countries. Consistent with the literature on business cycle synchronization, we then explore the underlying factors of synchronicity, focusing first on trade intensity between SSA countries and their partners and then controlling for other key determinants. As our focus is on the impact of SSA's trade relation shifts from the G7 toward the BRICs—which implies changes

in trade shares—on business cycle synchronization, we favour the framework proposed by Frankel and Rose (1997, 1998). This framework differs from the one widely used in the recent literature on within- and cross-border spillovers, in particular the Global Vector Autoregression (GVAR). GVAR models interdependencies at national and international levels but assumes constant rather than changing bilateral trade shares (Samake and Yongzheng 2011, Gurara and Ncube 2013).

The main findings are as follows. There is evidence that SSA has increasingly integrated into the global economy. The coefficient of correlation between the cyclical outputs of SSA countries and those of the RoW—the measure of synchronicity—is positive and has trended upward. Closer synchronization also matches with strengthening trade ties between SSA and the RoW. We also find that SSA's business cycles and trade are increasingly tied with those of the BRICs. This finding lends support to our premise that, with deeper trade integration, drivers of SSA's business cycles have changed. Our empirical results indicate that trade with the BRICs has the strongest impact on *BCS*, standing four times as large compared to the impact of trade with the G7, the main but declining trading bloc with the region. Much of this impact operates through the demand channel. Increased demand for African exports, largely primary commodities, has sustained the region's strong economic performance, which in turn has driven growing imports of manufactured and capital goods from the BRICs. Yet the patterns of trade with the BRICs suggest a product concentration that is more pronounced than with the G7. So far the effects of such features of trade are largely limited compared to the impact of the demand channel, which is sustained by trade. This corroborates growing concern over the continued lock-in of most SSA countries into few static and low value-added sectors and activities, which dim prospects for high and sustainable growth (UNECA 2013). Looking forward, intra-African trade, supported by the regional value chain, holds the key for strengthening business cycle correlation among SSA countries, hence supporting a third major powerhouse of growth to the region, but also for nurturing existing cyclical output co-movement with the BRICs and the G7. Another major finding is that alignment of fiscal policy in SSA to that of trading partners' supports cyclical output co-movement as suggested by the case of the relations between SSA with the G7. Further, greater financial openness has acted so far as a neutral factor, as financial linkages between SSA and its trading partners are still at a very early stage.

The remainder of this paper is structured as follows. The next section briefly reviews the drivers of *BCS*. Section III discusses the empirical strategy and data used in the analysis. Section IV presents and comments on the results, while Section V concludes.

II. THEORETICAL BACKGROUND

This section presents the determinants of business cycles synchronization as they relate to SSA countries.

The theoretical point of departure is the framework developed by Frankel and Rose (1997, 1998), in which trade constitutes the key driver of *BCS*. From a theoretical standpoint, the impact of increased trade on *BCS* is ambiguous. Stronger trade relations are likely to increase business cycle correlation through the aggregate demand channel. Consistent with the Keynesian multiplier principle, an expansion in one country results in an increase in demand

for imported goods and services from its trading partners, therefore transmitting the expansion to these partners. Furthermore, a similar outcome also emerges when intra-industry trade dominates trade relations. If much of the bilateral trade is intra-industry rather than inter-industry, any increase in trade integration induces similar industrial shocks which will lead to greater business cycle synchronicity. Trade integration that promotes intra-industry trade may offset the specialization effect (Frankel and Rose 1998, Imbs 2004, Baxter and Kouparitsas 2005, Caldéron and others 2007 and Inklaar and others 2008). If inter-industry trade dominates, then greater trade integration implies increased specialization. In such circumstances, industry-specific shocks result in lower output correlation (Imbs 2004).

The literature also suggests that the degree of economic specialization affects *BCS*. Krugman (1993) proposes that economic specialization drives industry-specific supply shocks and increases the magnitude of asymmetric shocks. If that is the case, trade is likely to increase business cycle decoupling. On the contrary, two economies that feature similar production structures are likely to be subject to analogous shocks, therefore displaying similar business cycle patterns (Imbs 2004). In sum, the more countries' production bases differ, the more their business cycles move away from one another.

The literature has also reported that financial integration drives *BCS*. The theoretical literature suggests that the direction of such causation could go either way. On the one hand, standard international business cycle models point to a positive correlation between financial openness and *BCS*. Countries witnessing favourable productivity shocks and financially connected to the RoW attract capital flows from countries that are not impacted by shocks. Conversely, when confronted with negative shocks, countries experience capital outflows in favour of other countries that are not affected by these disturbances. As a result, business cycles diverge (Backus and others 1992). On the other hand, models of financial contagion show that a negative shock in a banking sector may result in the reduction of the credit supply, therefore adversely affecting the domestic real sector. Under deeper financial integration, this shock is transmitted internationally as banks reduce their overseas lending in order to repair their balance sheets or to be able to continue lending in countries affected by the shock (Allen and Gale 2000, Morgan and others 2004, Perri and Quadrini 2010, Kollman and others 2011). However, this channel is likely to be muted for SSA countries given that most of these countries stand on the fringe of global financial markets.[2]

The business cycle literature further posits that pursing similar macroeconomic policies increases the likelihood of business cycle correlation (Böwer and Guillemineau 2006). Inklaar and others (2008), for instance, reported that, in OECD countries, the impact of macroeconomic convergence-particularly fiscal and monetary—on output correlation is as strong as that of trade intensity, referred to as *TI*.

Another set of factors that influences cyclical output correlation is global shocks affecting trading partners irrespective of whether they trade with one another or do not. Consider an increase in global demand and prices for primary commodities, driven in large part by the BRICs. SSA countries, which are mostly commodity producers and exporters, may benefit

[2] A few SSA countries, including South Africa, Nigeria, and Mauritius, with relatively well-developed stock markets, are more exposed to financial shocks than the vast majority of SSA countries.

from this expansion and witness higher value-added in their commodity sectors, hence increased GDP, even if they do not have direct trade linkages with the BRICs. Similarly, the global liquidity environment could also trigger the same effect. One recent illustration of this is the quantitative easing in some advanced economies and the ensuing influx of hot money into the BRICs and SSA, with some effects on the real sector in these groups of countries and on their business cycle synchronization. Another more encompassing global shock is global economic recession such as the one that affected the global economy toward the end of the 2000s. Such a shock depressed output levels, or at best output growths, in all economies, regardless of their degree of linkages.

A well-documented and consistent finding from this literature suggests that the trade channel is the most important engine of *BCS*, especially in developing countries, including in SSA countries (Baxter and Kouparitsas 2005, Caldéron and others 2007, Inklaar and others 2008, and Tapsoba 2009).

III. EMPIRICAL STRATEGY

A. Methodology

We assess the impact of trade integration on *BCS* by estimating coefficient, α_1, in the following equation:

$$BCS_{ijt} = \alpha_0 + \alpha_1 TI_{ijt} + \varepsilon_{ijt} \quad (1)$$

BCS_{ijt} represents the correlation between the output of country *i* and that of partner *j* and in time *t*; TI_{ijt} stands for trade intensity, thereafter termed *TI*, between country *i* and that of country *j* and in time *t*; and ε_{ijt} represents the classic white-noise error term. The sign of the coefficient, α_1, captures the direction in which *TI* influences cycle correlation between SSA countries and the RoW. This coefficient is positive when the converging effect of trade dominates, and negative when its diverging impact prevails. The value of the coefficient measures the magnitude of the impact of trade on *BCS*; hence capture the degree of SSA's output co-movement with various groups of countries.

Because of potential dual causality between *BCS* and *TI*, Ordinary Least Squares (OLS) estimator may not yield unbiased coefficients. We control for endogeneity by reverting to the instrumental variable (IV) estimation strategy.[3] This is the method that is consistently used across the analysis, unless indicated otherwise. Following Frankel and Rose (1997, 1998), basic variables of the gravity model are considered. These variables comprise the logarithm of the product of outputs; the logarithm of the distance between the main cities of the countries within the pair; a dummy variable for a common border, with this variable equal to

[3] A simple way to estimate equation (1) is to use Ordinary Least Squares (OLS). However, OLS may generate biased coefficients because of the endogeneity of *TI*. To be sure, countries displaying *BCS* are likely to trade more (or less) during common expansions (or common recessions). Moreover, monetary zone arrangement boosts both trade and macroeconomic policy. As a result, a positive effect of *TI* on synchronicity may be due to such arrangement. This is known to be the simultaneity bias.

1 if countries within the pair share a common border, and 0, if not; another dummy variable for common language, with this variable being set at 1 if countries within the pair have a common language spoken by at least 9 percent of their populations, and 0, if not. We also address potential heteroscedasticity by means of pair-clustering method. This assumes that observations for a pair of countries are not independent over decades. Put simply, observations of the first decade may affect those of the second and the third decade. An intercept and year dummies are included in all regressions. The purpose of year dummies is to account for potential common shocks to SSA countries and their trading partners, in other words, global shocks. These shocks may include changes in international commodity prices and global liquidity as well as a more encompassing shock—global economic recession or expansion.

B. Data

This section describes where the key variables are drawn from and how these variables are computed.

The first variable of interest is *BCS*. Business cycle is measured by the de-trended component of the logarithm of real Gross Domestic Product (GDP), in levels.[4] GDP data in constant U.S. dollars are taken from the IMF World Economic Outlook database. Consistent with widely accepted approaches in the literature on *BCS*, the cyclical component of output is computed using the Hodrick-Prescott's filter, hereafter, the HP filter (Frankel and Rose 1998, Rose and Engel 2002, and Darvas and others 2005). There has been some debate about the value of the smoothing parameter, λ, for annual data. Hodrick and Prescott (1997) initially set the value at 100. Rigorous evidence from Ravn and Uhlig (2002) subsequently puts the value of the above parameter at 6.25. The point of departure of the authors is to concur with the use of 1600 as the value of the smoothing parameter (λ) for quarterly data. They then derive a value for annual data by proceeding as follows: $\lambda = (1600)^{1/4} = 6.25$. Simulations based on values of the smoothing parameter (λ) —100 and 6.25—produce two different profiles. Of these two, the profile based on a value of 6.25 turns out to be the one that squarely mirrors the quarterly profile. We follow the latter in the paper and set the value of the smoothing parameter at 6.25. Furthermore, BCS_{ijt} is measured through a 10-year moving average of coefficients of correlation of the business cycle of country *i* and that of partner *j* in a given year *t*.

The second variable of interest is trade intensity, TI_{ijt}. The degree of *TI* between countries *i* and *j* in a given year *t* is equal to the value of bilateral trade divided by the sum of the total trade or the sum of the output of countries *i* and *j* in a given year *t*. Measures of TI_{ijt} used in this paper are those used by Frankel and Rose (1997, 1998) and Baxter and Kouparitsas (2005). Trade intensities (*TI1* and *TI2*) are computed as follows: $TI1_{ijt} = \frac{X_{ijt}+M_{ijt}}{(X_{it}+M_{it})+(X_{jt}+M_{jt})}$ and $TI2_{ijt} = \frac{X_{ijt}+M_{ijt}}{(Y_{it}+Y_{jt})}$. X_{ij} represents the bilateral exports, measured Free On Board (FOB),

[4] Some authors, such as Frankel and Rose (1997, 1998), Darvas and others (2005), and Inklaar and others (2008) use alternative proxies of economic activity such as industrial production or employment rate. Such data are not available for SSA countries.

of country *i* to country *j* in a given year *t* and M_{ij} stands for bilateral imports at the Cost-Insurance-Freight (CIF) value, of country *i* from country *j* in a given year *t*. X_{it} (M_{it}) stands for total exports FOB (total imports CIF) of country *i* in a given year *t*. Y_{it} represents the nominal GDP of country *i* in a given year *t*. Bilateral trade, total exports, total imports, and nominal GDP data are derived from the IMF's *Direction of Trade Statistics*. For such small economies as those from SSA, normalizing bilateral trade by total trade or output of the pair is likely to generate very marginal numbers. Because of this, we also express bilateral trade relative to SSA countries' trade and output along the following line: $TI3_{ijt} = \frac{X_{ijt}+M_{ijt}}{(X_{it}+M_{it})}$ and $TI4_{ijt} = \frac{X_{ijt}+M_{ijt}}{Y_{it}}$. We express the above measures of trade intensity in logarithmic form.[5]

Our dataset covers 44 SSA countries and their trading partners, and the period under consideration spans from 1970 to 2010. In total, the dataset includes at most 116,833 observations. As data are missing for some countries and for some years, we end up with an unbalanced panel.

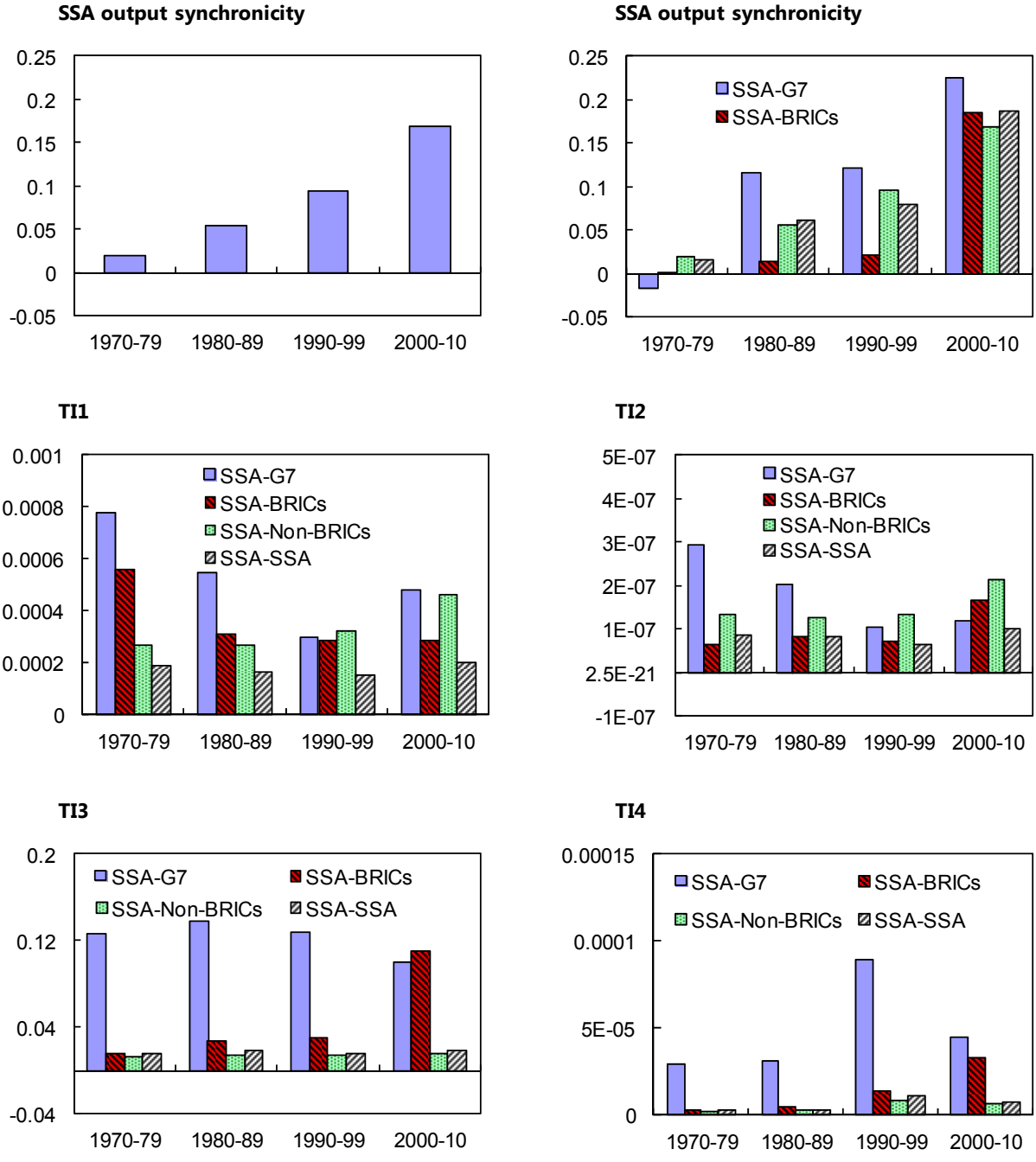
C. Stylised Facts

We first attempt to draw some stylized facts based on key variables of interest, in particular measures of *BCS* and indicators of *TI* described in the section on data (Figure 1). More specifically, we try to identify potential regularities on the association between these two variables across groups of countries and across time. For the period 1970-2010, average synchronicity between SSA countries and the RoW is positive and trending upward. This trend differs across partner blocs. Of all groups under consideration, the G7 countries are those with which SSA countries are more synchronized. The period of interest is then split into three sub-periods: 1970-79; 1980-99; and 2000-10. This breakdown uncovers a closer synchronization of outputs between SSA countries and other groups of countries, starting from 1980 and onward. More importantly, average output correlation across all country pairs not only strengthened but also seemed to be converging after 2000. The co-movement of output between SSA and the BRICs appears to have particularly gained steam. Closer synchronization also coincides with the growing trade between SSA and the RoW (Figure 1). The direction and volume of sub-Saharan Africa's bilateral flows have changed. Nowhere are these changes more conspicuous than that between SSA and the BRICs. Between 2001 and 2010, relative bilateral trade flows between SSA and the BRICs witnessed steeper increases than those recorded by trade within the region and with the G7. Also, rising trade flows with the BRICs seemed to have gained momentum after 2005, thus coinciding with the commodity price boom of the second half of the 2000s.

The sum of the above is that SSA's *BCS* and trade are concomitantly and gradually shifting from the G7 to the BRICs. This observation lends credence to our argument that with increased trade ties with the BRICs, the drivers of SSA's business cycles have changed.

[5] The estimates are still robust even without applying logarithmic form to *TI* variables.

Figure 1. SSA and the Global Economy: Output Synchronicity and Trade Intensity (1970-2010)



Source: Authors' calculations.

IV. RESULTS

A. Baseline

To confirm a potential link between greater synchronization and growing trade links, we perform a bivariate analysis. We regress our measures of business cycle co-movement on those of *TI* measures. To compare the relative magnitude of the effects of SSA's trade with these various groups, we compute standardized coefficients on *TI*. An intercept and year dummies are included in all regressions.

Results are reported in Table 1. They validate the argument that greater trade integration of SSA countries causes increased coupling of their business cycle with that of the RoW. We then consider the trade relations between SSA and various groups of countries, namely the G7, BRICs, non-G7 OECD, SSA, and remaining countries (RC). Our results show that closer business cycle correlation has moved in tandem with growing trade ties; and this is true irrespective of the groups of countries with which SSA trades. One result stands out from the computed standardized coefficients: trade with the BRICs has the strongest impact on *BCS*. Its effect stands four times higher than that with the G7, which is the main trading bloc for the SSA region, although in decline. Trade with non G-7 OECD countries also exerts a similar influence, albeit of relatively modest magnitude, on cyclical co-movements.

We also further explore whether trade and output co-movements are uniformly distributed across time. As the findings relate to the whole period under consideration, we investigate how the relationship between *TI* and *BCS* evolves over time and across groups of trading partners. Results are presented in Table 2. Trade with the G7 and the BRICs started affecting cyclical output correlation between SSA and these partners only from 1990 onward. This is coincident with the recent BRICs-driven commodity boom and growth spell it ignited in part across SSA.[6] The verdict on intra-SSA trade is somehow different, with this type of trade acting as an accelerating factor of *BCS* from 1970 to 2000, and as a neutral factor, thereafter. Such a recent decoupling effect of trade does not bode well with ongoing efforts to boost intra-Africa trade as a means to deepen regional integration and achieve a monetary zone. By contrast, non-G7 OECD is the only group for which the relationship between *TI* and output correlation does not qualitatively change over time. The coefficient on *TI* is consistency positive and significant. The findings on the remaining countries (RC) group lie in between all of the above. The direction and the statistical significance of the coefficient on *TI* between this group and SSA vary over time. The estimated coefficient is positive from 1970 to 1979, negative from 1980 to 1989, then insignificant from 1990 to 2000, only to turn positive from 2000 to 2010. This instability partly indicates the extent to which this group is diverse, with very limited discernible common patterns.

We also assess whether structural features affect the impact of trade intensity on business cycle synchronization. We therefore split the sample along the lines of one well-established classification: resource-rich SSA countries versus non-resource-rich ones.

[6] Evidence suggests that improved economic policies and strong domestic demand equally contributed to the growth spurt that started after the mid-1990s (IMF 2008).

Results based on this classification are summarized in Table 3. They suggest that for all trading blocs, but the remaining countries, the impact of trade on cyclical output correlation is weaker if the considered SSA country is a resource-rich one. This moderating impact on business cycle synchronization mirrors the diverging effect of resource-rich SSA trade, which is inter-industry in nature. The aggregate demand impact of increased trade flows on the business cycle outpaces the diverging effect of intra-trade, however.

We also investigate the extent to which the membership in a currency zone alters the impact of trade intensity on business cycle correlation. We consider a sample of African countries that are members of the region's two currency zones (CFAF Zone and the Rand Zone) and their trading partners (Table 4). The impact of trade with the BRICs on cyclical output synchronization continues to be the highest, although none of these countries is involved in either of the currency zones in place across Africa. Paradoxically, trade with G7 countries—three members of which that have their currency serving as the anchor currency for CFAF zone countries—has the least impact on business cycle synchronization. The finding raises questions about the current structure and functioning of currency zones or those in the making across SSA, most of which are using or expected to use the currencies of some G7 members as their anchor currencies.

Table 1. SSA and the Global Economy: Trade Intensity and Business Cycle Synchronicity

Dependent variable: business cycle correlation (Hodrick-Prescott filter)

	Simple IV											
	Overall		G7		BRICs		Non-G7 OECD		SSA		Remaining countries	
TI1	0.0134***		0.0101***		0.0347***		0.0298***		0.0114***		0.00574***	
	(0.000736)		(0.00240)		(0.00423)		(0.00156)		(0.00129)		(0.00156)	
TI2		0.0133***		0.00824***		0.0354***		0.0306***		0.0125***		0.00635***
		(0.000761)		(0.00252)		(0.00415)		(0.00163)		(0.00130)		(0.00158)
N	116,833	116,350	11,703	11,668	5,244	5,233	28,619	28,549	27,873	27,823	43,394	43,077
	Standardized IV											
	Overall		G7		BRICs		Non-G7 OECD		SSA		Remaining countries	
TI1	0.106***		0.0563***		0.221***		0.179***		0.0976***		0.0491***	
	(0.00580)		(0.0125)		(0.0260)		(0.00935)		(0.0111)		(0.0133)	
TI2		0.104***		0.0428***		0.213***		0.183***		0.108***		0.0544***
		(0.00595)		(0.0131)		(0.0249)		(0.00973)		(0.0112)		(0.0136)
N	116,833	116,350	11,668	11,668	5,233	5,233	28,549	28,549	27,823	27,823	43,077	43,077

Robust standard errors in parentheses

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

Intercept and Year dummies included.

Table 2. SSA and the Global Economy: Trade Intensity and Business Cycle Synchronicity over Decades

Dependent variable: business cycle correlation (Hodrick-Prescott filter)

		Simple IV			
Regions	Decades	TI1		TI2	
Overall	1970-79	0.0131***	(0.00263)	0.0134***	(0.00261)
	1980-89	0.0169***	(0.00207)	0.0172***	(0.00217)
	1990-2000	0.0291***	(0.00129)	0.0303***	(0.00135)
	2000-10	0.00143	(0.00104)	0.00186*	(0.00107)
G7	1970-79	-0.00953*	(0.00538)	-0.00976*	(0.00562)
	1980-89	-0.00736	(0.00492)	-0.00620	(0.00522)
	1990-2000	0.0234***	(0.00459)	0.0173***	(0.00484)
	2000-10	0.0258***	(0.00450)	0.0210***	(0.00479)
BRICs	1970-79	0.000192	(0.0127)	-0.00161	(0.0119)
	1980-89	-0.00386	(0.0101)	-0.00308	(0.00985)
	1990-2000	0.0557***	(0.00798)	0.0428***	(0.00844)
	2000-10	0.0476***	(0.00541)	0.0538***	(0.00559)
Non-G7	1970-79	0.0179***	(0.00428)	0.0200***	(0.00449)
OECD	1980-89	0.0149***	(0.00391)	0.0166***	(0.00409)
	1990-2000	0.0469***	(0.00295)	0.0486***	(0.00311)
	2000-10	0.0300***	(0.00241)	0.0298***	(0.00248)
SSA	1970-79	0.0314***	(0.00497)	0.0356***	(0.00549)
	1980-89	0.0124***	(0.00354)	0.0132***	(0.00363)
	1990-2000	0.0178***	(0.00188)	0.0192***	(0.00188)
	2000-10	-0.000177	(0.00195)	0.000733	(0.00194)
Remaining	1970-79	0.0166**	(0.00831)	0.0147*	(0.00798)
countries	1980-89	-0.0176***	(0.00680)	-0.0150**	(0.00711)
	1990-2000	0.00459	(0.00324)	0.00478	(0.00337)
	2000-10	0.00919***	(0.00176)	0.0103***	(0.00175)

Robust standard errors in parentheses

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

Intercept and Year dummies included.

Table 3. SSA and the Global Economy: Trade Intensity and Business Cycle Synchronicity, Resource-rich Countries versus Non-resource-rich Countries

Dependent variable: business cycle correlation (Hodrick-Prescott filter)

Standardized IV												
Resource rich												
	Overall		G7		BRICs		Non-G7 OECD		SSA		Remaining countries	
TI1	0.114***		0.0799***		0.148***		0.156***		0.0418**		0.180***	
	(0.0100)		(0.0206)		(0.0451)		(0.0176)		(0.0181)		(0.0240)	
TI2		0.121***		0.0608***		0.133***		0.158***		0.0528***		0.191***
		(0.0104)		(0.0213)		(0.0420)		(0.0186)		(0.0183)		(0.0259)
N	43,993	43,842	4,252	4,252	1,948	1,948	10,567	10,567	11,164	11,164	15,911	15,911
Non-resource rich												
	Overall		G7		BRICs		Non-G7 OECD		SSA		Remaining countries	
TI1	0.106***		0.109***		0.283***		0.244***		0.130***		0.00914	
	(0.00699)		(0.0161)		(0.0317)		(0.0111)		(0.0135)		(0.0159)	
TI2		0.106***		0.100***		0.284***		0.252***		0.136***		0.0121
		(0.00724)		(0.0172)		(0.0307)		(0.0116)		(0.0138)		(0.0160)
N	72,840	72,508	7,416	7,416	3,285	3,285	17,982	17,982	16,659	16,659	27,166	27,166

Robust standard errors in parentheses

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

Intercept and Year dummies included.

Table 4. SSA and the Global Economy: Trade Intensity and Business Cycle Synchronicity, Currency Zones

Dependent variable: business cycle correlation (Hodrick-Prescott filter)

Standardized IV												
SSA currency zones												
	Overall		G7		BRICs		Non-G7 OECD		SSA		Remaining countries	
TI1	0.128***		0.0466***		0.266***		0.174***		0.177***		0.248***	
	(0.00889)		(0.0178)		(0.0410)		(0.0138)		(0.0172)		(0.0245)	
TI2		0.126***		0.0302*		0.231***		0.176***		0.193***		0.261***
		(0.00902)		(0.0181)		(0.0376)		(0.0143)		(0.0171)		(0.0255)
N	47,127	47,011	4,863	4,863	2,109	2,109	11,512	11,512	11,251	11,251	17,276	17,276

Robust standard errors in parentheses

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

Intercept and Year dummies included.

B. Robustness checks

We conduct several robustness checks to ensure that our results do not depend on the measurement of business cycle synchronicity, the definition of trade intensity, the estimation technique, or on the position of countries in the business cycle.

First, we evaluate the sensitivity of our initial findings to an alternative measurement of cyclicality. The use of the HP filter is, however, subject to two criticisms. First, the HP filter is interpreted as a high-pass filter that removes longer fluctuations and treats them as part of the trend. Given this feature, this filter might not always be relevant from a policy perspective, particularly in SSA countries where institutions and policy responses are weaker than elsewhere. Turning the light on short- and medium-term fluctuations is of key relevance for these countries and the HP filter may not provide such a focus. Alternative filters to the one developed by Hodrick and Prescott (1997), in particular Baxter and King's (1999) band-pass linear filter, henceforth referred to as BK, also receive greater attention (Frankel and Rose 1997, 1998, Rose and Engel 2002, and Darvas and others 2005). These filters address the shortcomings of the HP-based filter.[7] However, despite its drawbacks, the HP filter generates results that are qualitatively similar to those of the BK filter (Table 5). This is in line with findings of previous papers such as Frankel and Rose (1997, 1998) and Caldéron and others (2007).

The above exercise is repeated using another measure labelled *TI2* which is trade intensity expressed in relation to GDP (Table 5). The findings are qualitatively unchanged under the alternative measure of cyclicality, the BK filter. Similarly, we also investigate whether the choice of either imports or exports—instead of imports plus exports—changes the findings. We compute a new measure of trade intensity using imports and then exports. Our findings confirm earlier results (Table 5). Trade intensity either measured through imports and exports has a predict content over business cycle synchronization.

Having found that the coefficients on *TI* are statistically significant and positive, we now check the robustness of our findings to alternative estimation procedures. We choose to perform quantile and tobit estimation strategies. On the one hand, the high degree of heterogeneity of our sample and significant within-group disparities, thus the existence of many potential outliers, militate in favour of quantile regressions. South Africa and Nigeria, the two largest economies of the region, may potentially act as outliers, hence justifying the use of the quantile estimation strategy. On the other hand, our key variable of interest, trade intensity, is censored at a lower threshold, 0, as values of bilateral flows are set at 0 when data are not available. There is therefore a case for trying tobit model estimation. Results of our quantile and tobit estimations are summarized in Table 5. *TI* measures enter all the regressions significantly, with the exception of those between SSA and the remaining countries. Overall, these findings show that trade intensification has resulted in SSA's output cycle synchronizing with those of its trading partners.

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[7] The Baxter-King filter addresses the shortcomings associated with the HP filter by combining a high-pass filter and a low-pass filter and by setting the length of cycle according to the assumptions of the authors. We assume that the length of the business cycle is between 2 and 8 years, which virtually matches the time span that was originally recommended by Baxter and King (1999) —6 to 32 quarters (*i.e.,* 1.5 to 8 years)

The next robustness test we conducted is to check whether the positive association between *TI* and output correlation is influenced by position in the cycle. In this regard, we consider two scenarios: the first focusing on times during which the trading partner's business cycle is positive, and the second, examining the period when the trading partner's business cycle is negative. Results are summarized in Table 5. It turns out that, for all groups of countries but the G7, trade triggers output correlation, independently of the trading partners' position in the business cycle. Good or bad fortunes in the BRICs, non-G7 OECD, within SSA, or in other remaining countries do not alter the positive impact of trade on business cycle correlation. The trade relations with G7 countries stand as the only exception. The positive association between *TI* and cyclical output correlation holds only when the economic tide is high in the G7 countries. Trade with the G7 has no impact on *BCS* in times when output is below long-term potential in the G7. A similar exercise is repeated—this time assuming various cycle positions in SSA. The findings squarely mirror the above results. Trade seems to be the main channel of business cycle transmission, except for the trade relations with the G7 when the business cycle in SSA is on the negative side.

We also consider situations when business cycles are synchronized positively and negatively and how trade plays out. Positive synchronicity is driven by trade, irrespective of the group of countries with which SSA countries have trade relations. However, findings differ in the case of negative synchronicity. Trade with the G7 turns out not to be the channel through which, a negative business cycle in the G7 is passed on to SSA countries.

These above findings echo the view that the output in SSA is increasingly decoupling from traditional partners' cycles, in particular the G7's, and anchoring instead on emerging countries' cycles, including the BRICs'. On the other hand, the findings lend credence to the conjecture that the recent economic revival in SSA owes much to growing demand in emerging countries, especially the BRICs, for the region's primary commodities. That raises concerns about this development perpetuating and even deepening the economic dependence of SSA on primary commodities or, in other words, on the vagaries of international commodity markets. This is all the more worrisome as trade with the BRICs tends to transmit negative business cycle shocks from the BRICs to SSA countries, contrary to trade with the G7 which does not. More interesting, intra-African trade is the only trade that has a cushioning effect when trading partners are in a negative phase of their business cycles.

Table 5. Robustness Tests

Dependent variable: business cycle correlation (Hodrick-Prescott filter, unless otherwise indicated)

Robustness test	Trade intensity	Overall		G7		BRICs		Non-G7 OECD		SSA		Remaining countries	
Baxter King Filter	TI1	0.0106***		0.000804		0.0290***		0.0170***		0.0133***		0.00932***	
		(0.000757)		(0.00250)		(0.00423)		(0.00161)		(0.00133)		(0.00167)	
	TI2		0.0105***		-0.000751		0.0296***		0.0175***		0.0143***		0.0102***
			(0.000780)		(0.00262)		(0.00418)		(0.00167)		(0.00135)		(0.00169)
Trade Intensity	TI3	0.0172***		-0.00914		-0.0235**		0.0419***		0.0140***		0.00753***	
		(0.000651)		(0.00687)		(0.0109)		(0.00276)		(0.00132)		(0.00158)	
	TI4		0.0174***		-0.000418		-0.00504		0.0432***		0.0157***		0.00837***
			(0.000648)		(0.00626)		(0.0104)		(0.00265)		(0.00134)		(0.00161)
Quantile regression	TI1	0.00711***		0.0223***		0.0116***		0.0196***		0.00886***		0.00178**	
		(0.000472)		(0.00249)		(0.00260)		(0.00131)		(0.000816)		(0.000755)	
	TI2		0.00727***		0.0226***		0.00743***		0.0186***		0.00978***		0.00104
			(0.000522)		(0.00247)		(0.00272)		(0.00140)		(0.000842)		(0.000775)
Tobit regression	TI1	0.00516***		0.0173***		0.0118***		0.0164***		0.00605***		0.000595	
		(0.000373)		(0.00181)		(0.00221)		(0.000988)		(0.000703)		(0.000558)	
	TI2		0.00559***		0.0180***		0.01000***		0.0161***		0.00681***		-0.000117
			(0.000372)		(0.00174)		(0.00224)		(0.000966)		(0.000696)		(0.000552)
Alternative Measurement of Trade Intensity, Standardized IV	Imports	0.133***		0.0676***		0.308***		0.222***		0.0748***		0.141***	
		(0.00698)		(0.0138)		(0.0329)		(0.0116)		(0.0163)		(0.0170)	
	Exports		0.150***		0.0590***		0.248***		0.210***		0.0621***		0.120***
			(0.00745)		(0.0133)		(0.0262)		(0.0110)		(0.0159)		(0.0168)

Table 5. Robustness Tests (concluded)

Dependent variable: business cycle correlation (Hodrick-Prescott filter, unless otherwise indicated)

Robustness test	Trade intensity	Overall	G7	BRICs	Non-G7 OECD	SSA	Remaining countries
Partner's positive cycle (IV)	TI1	0.0176***	0.0160***	0.0303***	0.0314***	0.0110***	0.0103***
		(0.00105)	(0.00331)	(0.00580)	(0.00218)	(0.00177)	(0.00218)
	TI2	0.0178***	0.0144***	0.0281***	0.0321***	0.0124***	0.0108***
		(0.00108)	(0.00352)	(0.00567)	(0.00226)	(0.00179)	(0.00221)
Partner's negative cycle (IV)	TI1	0.0137***	0.00605*	0.0426***	0.0242***	0.0110***	0.00496**
		(0.00106)	(0.00348)	(0.00584)	(0.00223)	(0.00184)	(0.00220)
	TI2	0.0135***	0.00449	0.0452***	0.0252***	0.0117***	0.00544**
		(0.00109)	(0.00366)	(0.00578)	(0.00233)	(0.00186)	(0.00224)
SSA positive cycle (IV)	TI1	0.0171***	0.0117***	0.0285***	0.0297***	0.00977***	0.00535**
		(0.00105)	(0.00321)	(0.00553)	(0.00212)	(0.00178)	(0.00217)
	TI2	0.0173***	0.0104***	0.0289***	0.0305***	0.0112***	0.00614***
		(0.00108)	(0.00337)	(0.00549)	(0.00220)	(0.00180)	(0.00220)
SSA negative cycle (IV)	TI1	0.0144***	0.00507	0.0309***	0.0236***	0.0115***	0.00380*
		(0.00107)	(0.00342)	(0.00616)	(0.00224)	(0.00182)	(0.00220)
	TI2	0.0143***	0.00212	0.0314***	0.0243***	0.0123***	0.00410*
		(0.00110)	(0.00361)	(0.00604)	(0.00233)	(0.00184)	(0.00223)
Positive synchronicity (IV)	TI1	0.00662***	0.00743***	0.0224***	0.0153***	0.00859***	0.00391***
		(0.000533)	(0.00197)	(0.00322)	(0.00123)	(0.000924)	(0.00114)
	TI2	0.00645***	0.00577***	0.0234***	0.0156***	0.00898***	0.00419***
		(0.000549)	(0.00207)	(0.00321)	(0.00128)	(0.000939)	(0.00115)
Negative synchronicity (IV)	TI1	0.00104	-0.00166	0.00773*	0.00789***	-0.00371***	-0.000726
		(0.000697)	(0.00218)	(0.00417)	(0.00149)	(0.00119)	(0.00144)
	TI2	0.000826	-0.00221	0.00511	0.00788***	-0.00345***	-0.00107
		(0.000726)	(0.00229)	(0.00406)	(0.00154)	(0.00120)	(0.00149)

Robust standard errors in parentheses

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

Intercept and Year dummies included.

C. Extension

Consistent with the literature on business cycle synchronization, we add a number of covariates to the baseline model as follows:

$$BCS_{ijt} = \alpha_0 + \alpha_1 TI_{ijt} + \alpha_2 X_{it} + \varepsilon_{ijt} \quad (2)$$

X_{it} denotes a series of factors outside trade that influence cyclical output co-movements. These variables include a measure of intra-industry trade and indicators of macroeconomic policy synchronicity and of financial integration. Intra-trade measure is captured through the Grubel-Lloyd index, IIT_{ijt}, which is a measure of trade specialization. The index mirrors the share of intra-industry trade and is expressed as follows: $IIT_{ijt} = 1 - \frac{\left|\sum_m \left(X_{ijt}^m - M_{ijt}^m\right)\right|}{\sum_m \left(X_{ijt}^m - M_{ijt}^m\right)}$.

X_{ijt}^m denotes the exports of an industry m from a country *i* to a country *j*, while M_{ijt}^m represents the imports of an industry *m* of a country *i* from a country *j*. Bilateral trade figures are based on the United Nations' *COMTRADE* data. These trade data are at the 3-digit level of SITC. This measure is equal to 0 when there is only inter-industry trade (*i.e.*, complete specialization); and 1, otherwise (*i.e.,* complete diversification).

Of all macroeconomic policies, discretionary fiscal policy is the most common and relatively effective instrument used by SSA countries and their partner blocs to stimulate their aggregate demand and output, therefore smoothing out their business cycle.[8] We therefore use the correlation of fiscal stances as a proxy of the similarity in macroeconomic policy stance. This indicator is defined as the coefficient of correlation between the cyclical component of general government expenditure (as a percentage of GDP) in SSA country *i and* partner bloc country *j*. Data on this variable is culled from the IMF's *World Economic Outlook*.

On financial integration, we could not find data that capture bilateral portfolio holdings, as suggested in the literature, and have to content ourselves with information on net total inflows of foreign direct investment (FDI). These data are drawn from the World Development Indicators 2013 (WDI 2013). Following the methodology proposed by Baxter and Kouparitsas (2005) in computing a measure of overall trade intensity of a given pair of countries, we define financial openness as the ratio of total net FDI of a pair of countries to the total GDP of these countries. The financial openness indicator is measured as follows:

[8] Evidence shows that monetary policy transmission to the real sector is limited for a number of reasons. The first layer of ineffectiveness is from policy stances to the costs at which financial and banking systems access their resources. Part of such weak pass-through is due to excess liquidity and underdeveloped interbank markets, both of which limit the size of retail banks' funding coming from these markets. Even when changes in monetary conditions trigger changes in the cost of borrowing of banking systems, this does not always lead to changes in credit conditions, hence the second layer of ineffectiveness. The underlying factors behind this are the following: the oligopolistic nature of the banking sector, the large fiscal deficits, and ensuring crowding out private lending. The third layer is from changes in credit conditions to the impact on the real sector. Weak financial deepening implies that very few have access to banking and financial services. As a result changes in lending conditions affect only a fraction of the real sector.

$FI_{ijt} = \frac{FDI_{it}+FDI_{jt}}{(Y_{it}+Y_{jt})}$, with FDI being the total net inflows of FDI, which turn negative if FDI outflows are larger than FDI inflows—and *i* denoting an SSA country; and *j*, its partner.

We also account for the impact of relative price changes on business cycle synchronization by considering the correlation of the terms of trade, in particular of the cyclical component of terms of trade, one of the determining factors of business cycle synchronization.

The analysis concentrates on the BRICs and the G7 only, the two main partner blocs at the core of our study. Results are presented in Table 6.

In line with the bivariate analysis, trade intensity with the BRICs, based on two different measures, enters the multivariate regressions positively. This validates our previous finding that points to a strong demand impact of trade—with the BRICs—on business cycle correlation. In addition to this positive contribution, trade integration also unleashes countervailing effects on cyclical output correlation, as evidenced by the negative and statistically significant coefficient on the interaction between intra-trade and trade intensity. This implies that the higher trade intensity, the stronger the output-decoupling force—assuming constant intra-industry trade. The finding shows that trade flows with the BRICs are relatively more between industries rather than within industries compared with those trade flows with the G7. Although such a pattern of trade tempers business cycle correlation, its effect does not offset the positive aggregate impact of trade intensity on cyclical output co-movements—or, in other words, the demand channel.

The results on the relations with the G7, particularly on the effects of trade integration and patterns of trade specialization, stand in stark contrast to the above. When an indicator for intra-trade is added, the coefficient on trade integration turns negative and slightly less robust—if at all significant. However, the measure of intra-industry trade—either alone or interacted with trade intensity—has a predictive and positive content over business cycle correlation. This suggests patterns of trade geared relatively toward intra-industry relations.

When compared to the earlier findings on the bivariate analysis, this indicates that the positive contribution of trade to business cycle correlation comes mostly from the fact that trade shocks emanating from the relations with the G7 countries are more industry-specific—as opposed to the patterns of trade with the BRICs—and that trade is relatively intra-industry.

Combining the findings, as they relate to the BRICs and the G7, causes us to indicate that increased diversification of geographical destination and origin of trade has not led to further product diversification but instead to more product concentration. The effects of such increased product concentration of exports have been muted so far, outweighed by the aggregate demand impact of trade.

Findings on the impact of fiscal policy stance symmetry differ whether the focus is on the BRICs or the G7. Similar fiscal policy stance between SSA countries and the G7 does cause further alignment of business cycles. Shocks in general government expenditure in the G7 countries, triggered by real shocks, may be transmitted to SSA countries, in the form of shocks in development assistance, which in turn will affect business cycles in SSA countries.

By contrast, fiscal policy stance symmetry between the BRICs and SSA countries has no impact on cyclical correlation between these groups. This finding does not imply the absence of fiscal multipliers at work in both SSA and the BRICs but rather suggests that fiscal

policies in these two trading groups are not synchronized. Financial openness enters the regression insignificant both in the cases of the relations with the BRICs and the G7. This result echoes the views that financial linkages between most SSA countries and their trading partners are at a very early stage and therefore have little effect on business cycle synchronization.

The variable terms of trade turns with a statistically insignificant coefficient. The lack of statistical significance of the coefficient on terms-of-trade and continued significant explanatory power of trade variables, when all are included in the same regression, may support the argument of the indirect effect of terms of trade. Indeed, similar terms-of-trade shocks may affect business cycle synchronization through trade.

Table 6. Trade Intensity and BCS: SSA, the BRICs, and the G7, Multivariate Model

Dependent variable: business cycle correlation (Hodrick-Prescott filter)

	Simple IV							
	BRICs				G7			
TI1	0.0752***	0.0932***			-0.0230**	0.00284		
	(0.0101)	(0.0108)			(0.0105)	(0.0100)		
TI2			0.0813***	0.104***			-0.0457***	-0.0165
			(0.0109)	(0.0116)			(0.0118)	(0.0111)
Intra-Industry Trade (IIT)	-1.156***	-1.568***	-2.365***	-3.211***	1.335***	0.780***	3.094***	1.984***
	(0.225)	(0.246)	(0.445)	(0.480)	(0.242)	(0.244)	(0.482)	(0.470)
TI1*IIT	-0.121***	-0.162***			0.121***	0.0660***		
	(0.0231)	(0.0249)			(0.0236)	(0.0234)		
TI2*IIT			-0.135***	-0.182***			0.165***	0.103***
			(0.0252)	(0.0270)			(0.0264)	(0.0256)
Correlation of General Government Expenditure as % of GDP		-0.0228		-0.0247		0.0190*		0.0207**
		(0.0167)		(0.0169)		(0.00993)		(0.0100)
FDI-to-GDP ratio (net inflows, pair level)		-0.00423		-0.0307		0.0235		0.0280
		(0.0766)		(0.0786)		(0.0297)		(0.0318)
Correlation of terms of trade shocks		0.00982		0.0159		-0.00725		-0.00663
		(0.0215)		(0.0218)		(0.0128)		(0.0130)
N	2,472	1,979	2,472	1,979	5,391	4,147	5,391	4,147

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Intercept and Year dummies included.

V. CONCLUSION

The confluence of the BRICs' rising influence on the global economy, their growing external links with SSA, and the economic revival in this region begs three questions: *i)* Are SSA's business cycles increasingly pulled by those of the BRICs—at the expense of the G7 and other traditional partners? *ii)* If so, what have been the contributing factors to this development? And *iii)* what are the policy implications of such a change? This paper has sought to respond to these queries.

We have shown that the business cycle in SSA has increasingly aligned to the BRICs' in recent years. Growing trade linkages between these partner blocs have driven this shift. Rising demand for African exports, mainly primary commodities, has bolstered the region's growth, which in turn has fuelled increased demand for manufactured and capital goods from

the BRICs. This has deepened SSA's trade specialization, with most flows taking place among industries and not within industries. Increased product concentration of exports seems to have ignited a countervailing force that has somewhat dampened cyclical output coupling. On balance, such opposite force has so far been muted, largely outpaced by the impact of the aggregate demand impulse from trade.

Another finding is the neutral impact of fiscal-stance symmetry and business cycle correlation in the case of the relations between SSA countries and the BRICs. This mirrors low degree of fiscal policy coordination between these two groups of countries. Similarly, the financial openness, at a very early stage, does not cause business cycles of SSA countries and the BRICs to move in opposite or in the same direction.

Underneath the above findings lie some opportunities and challenges related to greater engagement of SSA with the BRICs. First are the opportunities. Undoubtedly, stronger trade ties with the BRICs constitute the key dimension of the ongoing diversification of the destination and origin of Africa's exports and imports. This development has made the region less dependent on traditional partners, the G7 in particular, and increased resilience in the face of economic volatility occurring in these countries. Also, macroeconomic policy coordination, namely fiscal coordination, if deepened, may be relatively effective in synchronizing business cycles, therefore indicating that discretionary fiscal policy could be an effective instrument in governments' policy tool kit in Africa.

On the challenges, trade linkages with the BRICs would have delivered further business cycle synchronization if intra-industry trade underpinned such ties. It is important to reverse the growing concentration of their trade flows if an increased coupling of SSA countries' cyclical output with that of the BRICs is to generate meaningful benefits in terms of long-term economic and development prospects of the region. The promotion of intra-African trade, supported by regional supply chains, holds the key for successfully pursing a sustainable growth and development agenda in the medium and long term. First, as evidenced earlier, intra-African trade proves to be the only type of trade that has a cushioning effect on real output when SSA countries are in the negative phase of their business cycles. Second, increased intra-African trade will help raise the current low level of trade within the region and degree of coupling of business among countries of the region, therefore providing a third credible alternate growth powerhouse of economic activity, besides the G7 and the BRICs. Third, the expansion of intra-industry trade within SSA will also help generate production linkages within and between countries in the region, and build and leverage the competitiveness of firms operating in SSA. As a result, SSA countries will be better able to integrate into global manufacturing supply chains, and in so doing, replace other competitors—such as the BRICs—as the latter also move up in the value-chain ladder.

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