

Comovement Between Africa and Advanced Economies: 1980-2011*

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Abstract

This paper analyses business cycle comovement between African economies and advanced economies. It covers the period 1980 to 2011. The empirical analysis is based on the Dynamic Factor Model applied to annual data for African and G7 countries, covering the period 1980 to 2011. The results indicate that middle-income African countries show consistent business cycle variance shares, both before and after controlling for the influence of the G7. This implies that while middle-income African countries have coupled to the G7 business cycle since the 1980s, they have also coupled among themselves. Trade appears to be the important factor underlying the comovement. This is not the case for oil exporting countries and low-income economies that have, after controlling for the influence of the G7, all decoupled during the Great Recession. The case for fragile states is not conclusive, although these states do rely much more on trade with other African groups than with the G7.

Keywords: dynamic factor analysis; business cycle; decoupling
JEL codes: E32; F44; G01; O55

1 Introduction

Africa has made strides since the lost decade experience of the 1980s and especially since the 1990s, a previously much insulated Africa became much more integrated with the global economy (Sahn & Younger, 2004). For this reason, the Great Recession caused much concern for African growth and development (Fallon & Lucas, 2002; Rama, 2003). The possible negative effects of the 2008

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credit crunch seemed particularly severe for Africa, given the disastrous implications that reduced economic growth could have for human development efforts on the continent.

As the crisis unfolded, Africa, however, seemed to be very resilient. There was even speculation that, given the strong growth performance of certain African countries, the region had managed to decouple its business cycle from those in advanced economies. In fact, the decoupling hypothesis that became prominent during the Great Recession caused a flurry of business cycle analysis on emerging markets and reawakened a need to understand business cycle comovement between countries. An analysis of patterns of comovement for Africa as a whole has, however, been lacking. Therefore, this paper will analyse business cycle comovement between African and advanced economies covering the period 1980 and 2011. This period is selected since the reform and globalisation of African economies started gathering momentum in the mid-1990s, where after growth took off in the early 2000s. This period furthermore encompasses the years before, during, and immediately after the global financial crisis of 2008 and fills the current gap in the literature. Dynamic factor analysis (DFA) is employed to investigate business cycle comovement.

The article starts with a brief theoretical and literature review, followed by an overview of Africa's growth performance. The empirical analysis includes the explanation of the data used and the method applied, followed by the model and results. The article concludes that business cycle comovement with advanced economies became more pronounced for middle-income African countries during the period under investigation, while evidence of decoupling was experienced for low-income economies, oil exporters and fragile states.

2 Theoretical and literature review on comovement between Africa and advanced economies

The theoretical basis for comovement and potential decoupling lies in understanding the influence of business cycles between countries and is embedded in the International Business Cycle theory and the role of transmission mechanisms.

A seminal investigation into the empirical facts and theories behind the international business cycle was done by Backus, Kehoe and Kydland (1992). Their work builds on theory developed by Kydland and Prescott (1982), who investigated why comovement occurs across variables in a domestic economy.

In the Backus *et al.* (1992) model, the global economy consists of two countries with complete markets for state-contingent claims, each producing one homogenous product. These economies are subject to technology shocks in different periods. Economic agents furthermore participate in international capital markets and trade is frictionless, although labour is immobile.

As Backus *et al.* (1992) point out, introducing openness to the model allows agents to make use of international markets to share risk and smooth consump-

tion. This leads to negative output correlations across countries, since a positive technology shock in one economy will encourage capital flows from others. In this manner, events occurring in one economy may influence the real economy of another.

Baxter and Crucini (1995:821-823) investigate the impact that incomplete integration with global financial markets might have on comovement between economies. The Baxter-Crucini model investigates a restricted asset market, where only non-contingent bond trading is possible. In contrast to the negative correlations predicted by Backus *et al.* (1992), the authors find that output between economies will comove (showing positive correlations) under circumstances where one economy in this two-economy world is not fully integrated with global financial markets. This happens owing to the wealth effect that comes into play when output in one country increases as a result of a productivity shock. In a complete market, residents of a foreign economy would be able to lower their labour input when a positive production shock occurs in their neighbouring economy. This would happen because the foreign residents anticipate the positive wealth effect that will accompany this increased productivity when it reaches their own economy. If the wealth effect is not as large as expected, residents have access to complete asset markets with which to smooth consumption. In the absence of this insurance that is presented by complete markets, however, the tendency for foreign labour input to decline is less. For these reasons, Baxter and Crucini (1995) find that output does actually comove across countries. The authors conclude, however, that the sizes of these comovements are still not large enough to theoretically explain the trends observed in empirical data.

Backus, Kehoe and Kydland (1994) set up a model to investigate how trade influences business cycles. In this two-country model, countries produce specialised goods using both capital and labour. There is imperfect substitutability of goods produced between countries and labour is immobile. The good produced in each country will have both domestic and foreign contents, with the exact share of domestic to foreign inputs being determined by an Armington aggregator, which is a measure of elasticity of domestic to foreign goods. The net exports of each country in this model will be countercyclical. This is because net exports can be seen as the difference between output and the sum of consumption and investment in each economy, so that, whatever is not consumed or invested locally, is exported. Since consumers wish to smooth consumption between economies, investment will be procyclical: When output increases, it is possible to invest more, so that the difference between output and the sum of consumption and investment narrows. Net exports, therefore, decline. Conversely, when output decreases locally, it is not possible to invest as much. The difference between output and the sum of consumption and investment increases, and net exports increase.

In the theoretical framework postulated by Backus *et al.* (1994), comovement between economies therefore decreases when they trade intensively. If output in a domestic economy decreases and net exports therefore increases, the trading partner now has more inputs with which to produce and output in

the other economy will increase, and *vice versa*.

In contrast to the theoretical predictions of the abovementioned model, Canova and Dellas (1993) set up the two-country model so that each country specialises in the production of a different good. It is possible to either consume a good, or use it as an input in the production of another good. Complete markets exist with reference to state-contingent claims once again.

In this framework, when output in a country increases, it is possible for that country to export more. Conversely, the importing country now has more goods that can be used as inputs in their production process, and output in that country will therefore increase. In this manner, it is possible to see that trade allows output to comove between countries, as opposed to the negative output correlations predicted by Backus *et al.* (1994). The degree to which comovement occurs will depend on how strong the bilateral trade ties between economies are. Therefore, economies that trade extensively will experience more synchronised business cycles (Canova & Dellas, 1993; Frankel & Rose, 1998; Clark & van Wincoop, 2001). It can also be concluded that business cycle synchronisation will intensify when foreign goods account for a large proportion of inputs used in local production.

This idea of the imported business cycle, as was referred to by Canova and Dellas, might be particularly relevant to modern emerging markets, as the world has seen increased vertical specialisation of trade (Hummels, Ishii & Yi, 2001). Kose and Yi (2001) therefore extend the Backus *et al.* (1994) model by incorporating transport costs and allowing for the back and forth trade of goods between the two economies in the standard international business cycle theory, so that one country can sell a good to another country, which uses it as an input in the production process, where after selling the final good back to the original country. Intuitively, one would expect low transportation costs to be indicative of greater trade integration and, therefore, greater comovement. Kose and Yi, however, explain that low transportation costs could also more easily enable resource shifting between countries, so that business cycle comovement decreases. In this theoretical model, the conclusion therefore is that the resource-shifting effect of transportation costs dominates the trade integration effect.

In summary, the expectations that can be formed about decoupling between emerging market and advanced economies is not clear. International business cycle theory would argue that increased financial integration would cause lower synchronisation, as it becomes possible for countries to share risk on international capital markets. This leads to the expectation that emerging market economies could have decoupled by diversifying risks on capital markets. On the other hand, the model developed by Baxter and Crucini (1995) showed that a low degree of financial integration would likely lead to greater comovement with advanced economies.

Regarding trade, the theoretical expectations are also unclear. It is possible that the higher levels of trade integration seen in the global economy could have served to lower levels of business cycle comovement; again, thanks to the risk sharing that is possible within an open economy framework. It is possible, therefore, that emerging market economies could have shown lower business cy-

cle correlations owing to consumption smoothing made possible by trade and vertical specialisation. On the other hand, there is the possibility that countries that trade intensively would likely import business cycles, implying that emerging market economies would experience higher levels of business cycle synchronisation during the credit crunch.

The role of transmission mechanisms emphasises the channels such as trade and/or finance through which a shock in one economy might be transmitted to another. It is, however, also important to consider that not only the transmission of the shock, but the very nature of the shock, could cause comovement between economies. This happens where shocks are ‘common’; in other words, where external disturbances influence economies simultaneously (Stokman, 1988). Think, for instance, of the shared impact that a change in the oil price has on oil-dependent economies globally. Dellas (1986) found that business cycles of the UK, Japan, Germany and the US tended to comove owing to shared supply shocks and the adoption of similar policies in order to cope with such shocks.

Therefore, if economic shocks are common, output changes will tend to comove (Jansen & Stokman, 2004). If economic shocks are idiosyncratic, movements in output between countries will be more asymmetrical. Idiosyncratic shocks can still be transmitted between countries via trade and finance, as discussed in previous paragraphs.

With reference to the existing literature on the topic, the existing analysis of African comovement tends to take a regional focus, or to focus specifically on the comovement between one specific African country and an advanced partner (see, for example, Kabundi & Loots, 2007). The literature in the following paragraphs therefore discusses previous studies conducted on the issue of African comovement with advanced and BRIC economies, covering the period 2000 to 2014, in order to provide a broad background to the issue.

Ndulu and O’Connell (2007) used pooled conditional regressions to analyse the sensitivity of African growth rates to exogenous shocks between 1960 and 1997. The authors conclude that trading partner growth is a significant determinant of African growth, with African economies expanding by 0.4 per cent in reaction to a 1 per cent increase in trading partner growth.

Drummond and Ramírez (2009) studies 40 African economies between 1980 and 2008 using dynamic panel growth regressions and found further evidence that global growth slowdowns will indeed cause growth slowdowns in SSA. Results show that a one percentage point slowdown in the rest of the world leads, on average, to a 0.4 percentage point slowdown in Sub-Saharan African (SSA) growth. Income effects from changes in non-fuel commodity prices and oil prices are also found to have a significant impact on growth in SSA.

Gurara and Ncube (2013) estimate a Global Vector Autoregressive (GVAR) model for 46 African economies and 30 foreign economies between 1980Q1 and 2011Q2. General impulse response functions indicate that Africa is still very sensitive to European economic conditions, with a one per cent decline in Eurozone growth decreasing African growth by as much as 0.6 percentage points. The BRIC economies also have significant impacts on African economies, al-

though the magnitude of these is found to be only about half of the equivalent decline in European countries.

Diallo and Tapsoba (2014) show that SSA does display high levels of comovement with the rest of the world. The authors investigated comovement by using instrumental variables for 44 Sub-Saharan economies between 1970 and 2010 using panel methods. Results show that the patterns of comovement have shifted somewhat, as SSA is now less sensitive to G7 developments, but comoves more and more with BRIC partners. The increased trade between SSA and BRIC countries has contributed especially to this shift.

A further study by Ncube, Brixiova and Meng (2014) takes a more regional approach to the issue of comovement. Annual GDP data spanning 1980 to 2011 is used to construct an SVAR (structural vector autoregressive) model for countries in Sub-Saharan Africa, and 34 advanced economies. Results show that idiosyncratic factors are mostly responsible for driving output fluctuations in African economies. Regional factors are much more significant in explaining output in the Eastern African Community (EAC) than they are in the Southern African Customs Union (SACU), whose domestic growth rates are much more likely to be influenced by global shocks. South Africa's globalised financial system especially played a role in transmitting the shocks from the global financial crisis to SACU member countries.

Bangwayo-Skeete (2012) employs a generalised method of moments approach covering the period between 1961 and 2005 to determine whether common global factors are important in explaining Africa's economic growth. The author finds that global factors are significant, with the global business cycle having a positive influence on African economic growth. This shows that African economies are still dependent on developments in advanced economies. Table 1 provides a summary of the studies discussed here.

As seen from the literature review, the literature on comovement between Africa and the rest of the world, especially advanced economies, is sparse. In general, though, the picture that emerges from the available literature is one of an Africa that is still very susceptible to changes in trading partners' economic conditions. Europe especially has traditionally been an important trading partner for much of SSA and the literature shows that this has remained largely true, with changes in European growth having important spillover effects on African growth. This is not to say that trading partners have remained the same throughout, though. While advanced countries in the Eurozone especially still have an important impact on growth in African economies, the literature suggests that the US and other G7 trading partners have become less dominant players as African trade shifts increasingly toward other developing and emerging partners.

Although a few studies do include samples that cover the Great Recession years, these have been for more narrow sets of countries. Ncube *et al.* (2014), for instance, focus only on the Southern African Customs Union (SACU) and Eastern African Community (EAC) countries. None of these studies have used factor analysis or looked at SSA countries on the basis of income group rather than region. The focus of VAR models used in many of these studies is on

estimating the size of spillover effects and not determining what exactly the factors are that drive comovement. The use of factor analysis and income groups for a period spanning the Great Recession is the contribution made in this paper's empirical analysis.

3 African growth performance before, during and immediately after the crisis

This section focuses specifically on African growth performance in the years between 1980 and 2011 in order to provide background to the empirical analysis. Since the Great Recession had caused much concern for African growth, macroeconomic trends that emerge leading up to, during and immediately after the crisis are also discussed in order to determine whether, at face value, African economies seem to have decoupled since 1980 or not.

A variety of encouraging factors, such as policy reform focusing on macroeconomic stability and liberalisation, and greater political stability (Sahn, Dorosh & Younger, 1999), added up to strong economic growth on the African continent between 1980 and 2012. This is shown in Figure 1.

What is also clear from Figure 1 is that African GDP growth has been rather erratic, with many up and downturns to be seen. Africa's poor growth performance during the 1990s can also be clearly seen. By 1992, growth on the African continent had dipped to far below its 1980 level, only recovering around 1996. Growth then plummeted once more, although not as drastically as during the early nineties, and remained close to approximately 3 per cent until the early 2000s. Only then does it become evident that the reforms implemented during the 1990s had started paying dividends, with the favourable global environment discussed by Carmody (2011), plus African policy reforms, helping to put growth on a much stronger path. African growth shot up in 2003, with the continent's GDP standing at approximately US\$800 billion right before the credit crunch in 2007. African growth clearly was influenced by the credit crunch, as the growth rate declines in 2008 and 2009, when it reached a low point of merely 2 per cent. This is compared with the average annual growth of almost 7 per cent in 2007. After 2009, growth did recover, although not to pre-crisis levels. The growth contraction experienced by African economies is shown more clearly in Figure 2, which depicts the average growth rates that African and developed economies experienced during the worst of the crisis years, namely 2008 and 2009.

Compared with global growth, and growth in advanced economies especially, African growth during the Great Recession was lower than before, but still performing well. Advanced countries as a group experienced contractions in their economies in these years, with average GDP growth of minus 2 per cent between 2008 and 2009. During the same time, Africa as a whole still managed to grow by an average of almost 4 per cent.

When discussing the impact of the crisis, it is good to bear in mind that African countries are very heterogeneous, and that impacts of the crisis might

have differed between regions and individual countries. Figure 3 illustrates the regional¹ growth performance in Africa during this time.

It can be seen from Figure 3 that Central Africa, from its high annual average growth of 6 per cent up until 2007, experienced a strong decline in growth, with GDP growth averaging about 3 per cent for the two crisis years. Other regions seemed to have fared somewhat better. West African GDP growth notably increased during the crisis years, from an average of around 4.5 per cent in the years up until 2007, to an average annual rate of 5 per cent during the crisis years. The reason behind this is likely that West Africa is still not much integrated with the global economy. Seck (2010) points out that West Africa's share of global trade has been steadily declining and that the region is not a popular destination for FDI inflows. It is also likely that the good growth performance seen for West Africa as a region here can largely be attributed to Nigeria, which fared well throughout the credit crunch owing to proactive government policy and an expanding non-oil sector that had shielded the Nigerian economy from the worst of the volatility in oil markets at the time of the crisis. East Africa also experienced a decline in GDP growth, although the contraction was much smaller than that experienced by Central Africa. North and Southern Africa both experienced growth declines in those two years, with North Africa contracting from average annual pre-crisis growth of just below 5 per cent to just above 3 per cent. Southern Africa's economic growth declined from just above 4 per cent to just above 3 per cent.

It should be noted, though, that this regional averaging of growth does not accurately illustrate the expected impact of the crisis on individual countries. The presence of some of Africa's largest economies, such as Nigeria and South Africa, means that the regional averages are skewed towards these large economies. Examining GDP growth by income group and oil-exporting status² provides further insight into the differing ways in which various African economies were influenced by the crisis, as can be seen in Figure 4.

In the years leading up to the crisis, middle- and low-income economies in Africa had displayed steady economic growth, with average annual rates of 4.6 and 5.5 per cent, respectively. During the initial crisis years of 2008 and 2009, however, it seems that middle-income economies were more influenced than their low-income counterparts were. Middle-income economies experienced a growth slowdown during those years, with annual growth averaging 2.8 per cent. Low-income economies, on the other hand, managed to increase average annual growth very slightly, to 5.6 per cent.

Oil-exporting countries clearly suffered large contractions during the crisis years. Pre-crisis growth had averaged 8.7 per cent per year for this group. During the crisis years, growth contracted and oil exporters grew by an average of 4 per cent. This points to the important linkage that commodities provide to global financial markets for many oil-exporting countries (Cramer, Johnston & Oya, 2009). Kasekende *et al.* (2010) also found that resource-rich economies

¹ Regions here are aggregates as defined by the World Bank.

² Classifications according to International Monetary Fund (2014).

in Africa were much more strongly influenced than their counterparts were.

Fragile states managed to increase growth during the crisis years. This is likely attributable to the fact that these economies are not integrated with the global economy. Trade disruptions that had severe growth implications for other African economies would not have figured as strongly.

The varying growth rates on the continent throughout the crisis reflect the fact that policy responses to the crisis also varied. Many African economies had managed to build up solid surpluses and reserves in the years leading up to the crisis. For these economies, it was possible to institute the necessary counter-cyclical policies. Other economies, especially of the continent's fragile states, were not in the same position (Kasekende *et al.*, 2010). Still, other African economies applied expansionary monetary policy in reaction to the global economic downturn. These were mostly the emerging economies in Africa, most of which used a policy mix of fiscal and monetary measures to attempt to stimulate their local economies.

What remains to be answered is the empirical question regarding Africa's comovement with advanced economies. Have the past two decades of reform and growth meant that Africa's real economic performance is more susceptible to global developments, or do idiosyncratic factors dominate? The empirical analyses and results that answer this question are now presented in the following section.

4 Data method and the model

4.1 Data and method

In order to investigate the decoupling hypothesis for SSA (referred to hereafter as 'Africa'), DFA is employed. Two steps are followed: Firstly, factor analysis is conducted on real variables for African countries and the G7. Secondly, in order to control for the possible effect of the G7 as trading partner for African economies, the G7 factor is removed from the data and factor analysis is performed again.

Given the diverse performances of various groups of African economies, individual African economies are grouped together into middle-income countries, low-income countries, fragile states and oil-exporting economies. Group variables for these economies are constructed using GDP PPP weights. The classification of countries according to these groups is that of the IMF, and the following countries are included:

- Oil exporters: Nigeria, Angola, Cameroon, Chad, Congo (Rep), Equatorial Guinea, Gabon.
- Middle-income countries: Botswana, Cape Verde, Ghana, Lesotho, Mauritius, Namibia, Senegal, Seychelles, South Africa, Swaziland, Zambia.

- Low-income countries: Benin, Burkina Faso, Ethiopia, Gambia, Kenya, Madagascar, Malawi, Mali, Mozambique, Niger, Rwanda, Sierra Leone, Tanzania, Uganda.
- Fragile states: Burundi, Central African Republic, Comoros, Democratic Republic of the Congo (DRC), Cote d'Ivoire, Eritrea, Guinea, Guinea Bissau, Liberia, Sao Tome, Togo, Zimbabwe.

Annual data for the period between 1980 and 2011 is obtained from the World Bank's African Development Indicators database. This data is for GDP, imports, exports, consumer price index (CPI), foreign direct investment (FDI) inflows, official development assistance (ODA) receipts and the business cycle. Business cycles are extracted from GDP using the HP filter. Indices for oil prices, as well as food and mineral prices, are also included as global variables. Annual data for G7 variables, such as imports and exports, GDP, CPI, PPI and unemployment, is obtained from the FRED (Federal Reserve Economic Data) database. This results in a sample of 37 observations (N) over 31 years (T).

All data is logged (except in the case of negative values) and checked for stationarity using the Augmented Dickey-Fuller (ADF) test. Where necessary, and as indicated by the ADF, data is differenced in order to ensure stationarity before proceeding with the factor analysis. Two factors are specified according to the Alessi, Barigozzi, and Capasso (2010) (ABC) criteria.

4.2 The model

DFA is used to investigate the comovement between different macroeconomic variables across countries. The model is based on the idea that variance in time-series variables is driven by a few latent factors (r), which we can call a common component. Comovement or variance in the variables can also be influenced by certain features that are specific to individual data series, which can be called an idiosyncratic component.

Therefore, we can represent a vector of time series $Y_t = (y_{1t}, y_{2t}, \dots, y_{Nt})'$ as the sum of a common component, $X_t = (x_{1t}, x_{2t}, \dots, x_{Nt})'$ and an idiosyncratic component, $e_t = (\varepsilon_{1t}, \varepsilon_{2t}, \dots, \varepsilon_{Nt})'$.

This gives:

$$\begin{aligned} Y_t &= X_t + e_t \\ T_t &= \Lambda F_t + e_t \end{aligned} \tag{1}$$

Where:

$X_t = \Lambda F_t$ represents the common component the part of the series that depends on common factors; e_t represents the idiosyncratic component that part of each series that is variable specific and orthogonal to the common component;

And:

Λ is the $N \times r$ matrix of factor loadings consisting of the non-zero columns of Λ and with $r < N$; F_t represents the vector of r common factors.

Since $T, N \rightarrow \infty$ the common components can be identified using principal component analysis for the variance-covariance matrix of the observable data, $cov(Y_t)$. The variance-covariance matrix is summarised by a dimension reduction matrix with $N \times 1$ vector of eigenvalues from the variance-covariance matrix wherein the first largest eigenvalues and vectors have been calculated so that:

$$X_t = VV'Y_t \quad (2)$$

With:

V' representing the $N \times r$ matrix of eigenvectors that correspond to the largest r eigenvalues of the correlation matrix for Y_t .

F_t , the common factors, are estimated using principal component analysis and can be represented as:

$$F_t = V'Y_t \quad (3)$$

Where V is an estimate of factor loadings equal to Λ . The idiosyncratic factors can therefore be defined as

$$e_t = X_t - Y_t \quad (4)$$

5 Results

Table 2 presents a summary of variance shares obtained for this analysis. Note that the variance share is similar to the R-square in conventional regression analysis, and gives an indication of the amount of variance in a variable that is attributable to common factors.

The variance shares paint a general picture of decoupling between the particular African groups and the G7, with variance shares being generally low. It is noticeable that the highest variance shares can be seen in global variables such as G7 imports and exports. Low-income African economies also show high variance shares in imports and exports.

Matching the factors produced from the analysis to the original macroeconomic series shows that G7 trade and low-income country trade were the two factors driving the comovement between G7 and African economies. The dominance of the G7 trade factor is not surprising, given the importance of this group of economies globally. Taking the G7 as a proxy for advanced nations, these results therefore show that trade demand from advanced nations is an important driver of comovement for the African groups that were studied.

The high variance shares attributed to low-income imports and exports highlight the trade dependence of these economies. It is noteworthy that trade-related variance shares for the other African groups are not as high.

Inspecting the remaining variance shares reveals another noticeable trend. After the high variance shares reported for low-income trade variables, the next African group that displays higher relative variance shares comprises middle-income countries. Middle-income variance shares related to GDP, imports and ODA are higher than variance shares for other groups. Of the variance shares

related to business cycles of African groups, middle-income countries display the highest variance shares. Thirty-eight per cent of the middle-income business cycle is explained by a common component, as opposed to 34 per cent for fragile states, 12 per cent for low-income countries, and just 5 per cent for oil exporters. Furthermore, up to 45 per cent of middle-income GDP is explained by a common component, as opposed to only 35 per cent for low-income countries and oil exporters, and just 22 per cent of the GDP of fragile African states. These patterns illustrate the fact that business cycles of middle-income African economies are strongly integrated with the G7.

Two further interesting facts stand out from the variance share results. Firstly, some variables relating to fragile states display higher variance shares. For example, 39 per cent of fragile states' imports are explained by a common component and so is 34 per cent of the business cycle. This is much higher than, for instance, the variance explained in the business cycle of oil-exporting economies. Given the low development levels of these economies, the conclusion is drawn that fragile states are susceptible to global shocks. Secondly, the fact that variance shares for oil exporters are rather low is interesting. It is true that approximately a third of their exports are explained by a common component, as might be expected. The variance share for the business cycle is, however, low. This shows that oil-exporting countries' business cycles are still dominated by idiosyncratic factors. As pointed out by the IMF (2008:7), for example, growth in African oil exporters' GDP in 2008 could be ascribed to factors such as on-going instability and violence in Nigeria and Chad, rather than to global events taking place during that time.

From the variance shares presented, the conclusion can be drawn that African groups in general have decoupled from the G7, with clearly different experiences among groups such as middle-income countries, oil exporters, low-income and fragile states. A final caveat needs to be investigated, however. Given the aggregation of countries into income groups, it is possible that the comovement seen is not necessarily the strict comovement of African groups with the G7. Therefore, for example, middle-income African economies might display higher variance shares than their fragile counterparts do, because many economies included in this group trade with the G7 and comovement is therefore attributable to a shared trading partner rather than to anything else.

Therefore, another DFA is conducted, but this time using only G7 data. These variables include G7 aggregates for imports, exports, GDP, business cycles, and CPI, as well as imports, exports, GDP, business cycles and CPI for each individual member country of the G7. Following this, the factors obtained from the factor analysis are regressed against the variables for the African groups (GDP, business cycle, CPI, imports, exports, ODA and FDI flows for low-income, middle-income, fragile and oil-exporting African states). The residuals obtained from this regression are then used for another factor analysis. Having now controlled for the common influence of the G7, it is possible to see what comovement looks like between these African groups by analysing the variance shares obtained. These are presented in Table 3.

When comparing the results in Table 3 with the results reported in Table 2,

it can be seen that variance shares are generally smaller after having controlled for the G7 influence. This shows that the comovement that could be seen in variance shares reported previously in Table 2 was largely attributable to the influence of the G7. African groups are therefore not co-moving with one another, indicating that financial integration across the continent is low and that intraregional trade is also limited.

There are two exceptions to the generally lower variance shares that can be seen here. Firstly, removing the G7 influence causes the variance share for certain fragile state variables to increase quite drastically. Whereas in the previous estimation, low-income African countries showed the highest variance shares, here that is true for fragile states. For GDP, 65 per cent of fragile GDP is now explained by a common component, as opposed to 22 per cent previously. Sixty-nine per cent of fragile state imports are now explained by a common component, compared to 39 per cent before the G7 was controlled for. The fact that the variance share on imports is now much higher suggests that fragile states are more integrated in trade with other African groups than they are with the G7. However, business cycle variance share has now declined to just 3 per cent. This means that idiosyncratic factors drive the variance seen in the business cycle here. Given the political instability and economic fragility experienced by these economies, it is possible that the trend depicted here can be ascribed to an ‘Africa factor’ for these countries.

The second exception pertains to middle-income countries. Forty per cent of the middle-income business cycle, as well as 40 per cent of middle-income GDP, is explained by a common component. These findings are close to those reported in the original analysis, when 45 per cent of middle-income GDP and 38 per cent of the middle-income business cycle were explained by a common component. The analysis performed after controlling for the G7 variables therefore confirms results obtained earlier: Middle-income African countries are closely linked to the business cycle in advanced economies.

Variance shares for oil exporters are still low after controlling for the G7, once again highlighting the importance of idiosyncratic factors for these countries. As for low-income countries, the business cycle variance share does not change much when controlling for the G7. Variance shares for imports and exports decline substantially, however, suggesting that low-income countries still rely very much on G7 trade.

In summary, then, the dynamic factor analyses conducted for Africa and the G7 show that African economies are still very dependent on the G7. This is seen in the fact that, while variance shares were generally low when including the G7, they declined even further when controlling for the G7. Middle-income African countries showed the strongest coupling to the G7, with variance shares for the business cycle being robust to controlling for the G7. Low-income and oil-exporting countries also show business cycle variance shares that are robust to this change, although the variance shares are so low as to suggest a decoupling. Fragile African states seem to be much more reliant on trade with other African groups than with the G7, although the fact that business cycle variance shares decline when controlling for the G7 could be indicative of coupling between these

economies and the G7. The unique pattern displayed by fragile states leaves room for future research to be conducted.

6 Conclusion

In order to shed light on patterns of African comovement in the years leading up to, during and immediately after the crisis, this paper analysed comovement between Africa and advanced economies by using a dynamic factor model. The results suggest that levels of comovement depend on income level. The empirical analysis concludes that middle-income African countries are the only group that shows consistent business cycle variance shares, both before and after controlling for the influence of the G7.

This implies that while middle-income African countries have coupled to the G7 business cycle since the 1980s, they have also coupled among themselves. This points to higher levels of intraregional finance and trade among these economies. Before controlling for the G7, low-income economies showed high variance shares for imports and exports. This shows that trade is an important transmission mechanism for low-income African economies, whose trade is not as diversified as that of other African countries.

When controlling for the G7, however, variance shares diminish. This confirms the trade dependency of low-income African countries on advanced trading partners. Fragile states display an interesting pattern. Business cycle comovement for this group is comparable to that of middle-income countries when including the G7, indicating that fragile states are more coupled to the G7 than are oil exporters and low-income economies. However, when controlling for the G7, business cycle variance share decreases drastically. This suggests that the initial coupling seen was entirely due to the common effect of the G7 as a shared trading partner for these economies. While removing the G7 decreases business cycle variance shares, it increases variance shares in GDP and imports, suggesting that fragile states rely much more on trade with other African groups than with the G7. Oil exporting economies show low variance shares throughout the analysis – both when including and excluding the influence of the G7. There has been quite strong decoupling for oil exporters, therefore. This result suggests that idiosyncratic disturbances in these economies are most important for business cycles. Oil exporters should focus policy on ensuring stable macroeconomic and political environments.

Finally, the fact that G7 trade emerges as an explanatory factor in the empirical analysis underlines a recurrent theme throughout this paper, i.e. trade fosters comovement. For the African groups studied here, trade with the G7 still dominates, as seen in the impact that the removal of the G7 factor had on variance shares. The management of trade policies should therefore be important for African policymakers. Diversified trade could shield economies from future advanced economic crises.

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Table 1: Literature on co-movement between Africa and advanced economies

Authors	Period covered	Method used	Main conclusion
Bangwayo-Skeete (2012)	1961-2005	GMM	The global business cycle significantly influences Africa's economic growth.
Diallo and Tapsoba (2014)	1970-2010	Instrumental variables	SSA displays less sensitivity to G7 shocks, but is co-moving more with BRIC countries.
Drummond and Ramírez (2009)	1980-2008	Dynamic panel growth regressions	A 1.0 percentage point decline in world growth slows SSA growth by 0.4 percentage points on average.
Gurara and Ncube (2013)	1980-2011	GVAR	African growth is still very responsive to European slowdowns, with 1.0 per cent lower European growth leading to 0.6 per cent lower growth for Africa.
Ncube, Brixiova and Meng (2014)	1980-2011	SVAR	Idiosyncratic factors, not common components, explain output fluctuations in African economies.
Ndulu and O'Connell (2007)	1960-2007	Pooled conditional regression	Trading partner growth is a significant determinant of African growth

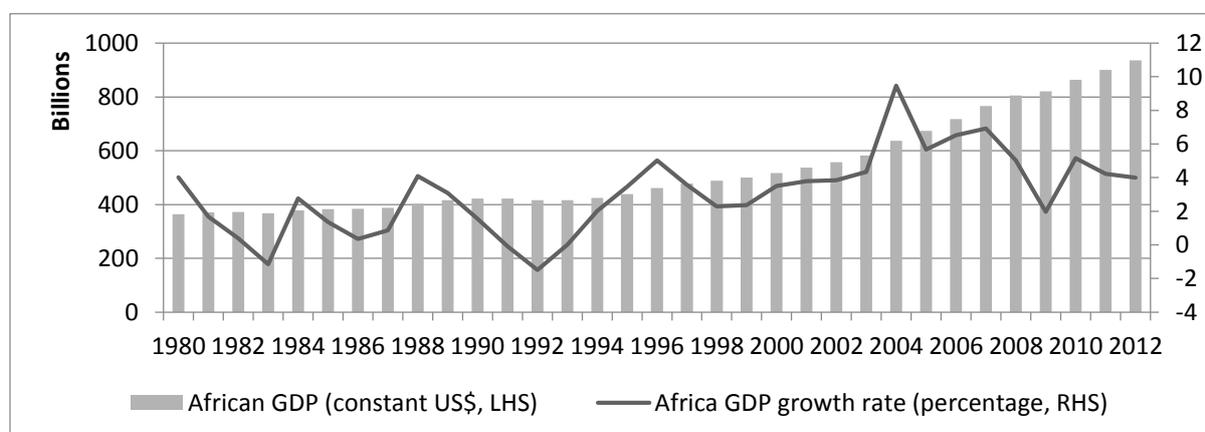
Table 2: Factor analysis results for Africa and G7, 1981-2011

	G7	Low income	Middle income	Fragile states	Oil exporters
GDP	0.27	0.35	0.45	0.22	0.35
Imports	0.75	0.62	0.41	0.39	0.11
Exports	0.68	0.69	0.23	0.15	0.31
ODA		0.00	0.39	0.07	0.08
FDI		0.06	0.04	0.13	0.14
CPI	0.25	0.05	0.05	-	0.12
Business cycle	0.26	0.12	0.38	0.34	0.05
PPI	0.59				
Unemployment	0.23				

Table 3: Factor analysis results for Africa and G7 (excluding the G7 factor)

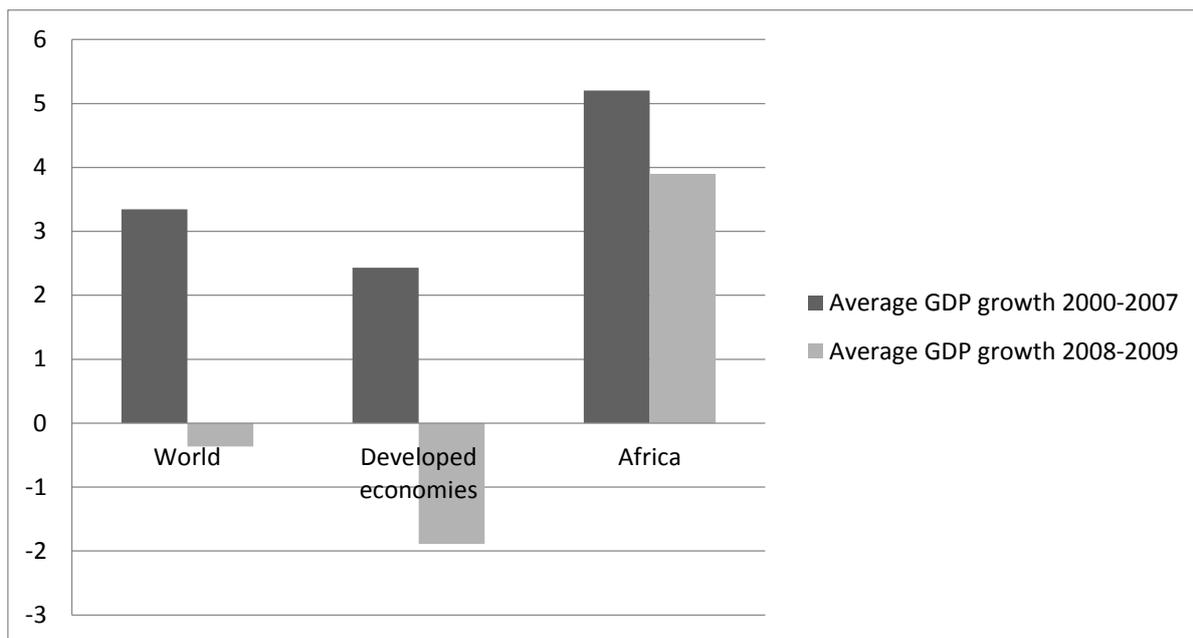
	Low income	Middle income	Fragile states	Oil exporters
GDP	0.08	0.40	0.65	0.02
Imports	0.16	0.02	0.69	0.00
Exports	0.25	0.02	0.11	0.00
ODA	0.26	0.13	0.00	0.01
FDI	0.03	0.14	0.01	0.01
CPI	0.05	0.00	-	0.32
Business cycle	0.11	0.40	0.03	0.04
PPI				
Unemployment				

Figure 1: African GDP trends, 1980-2012



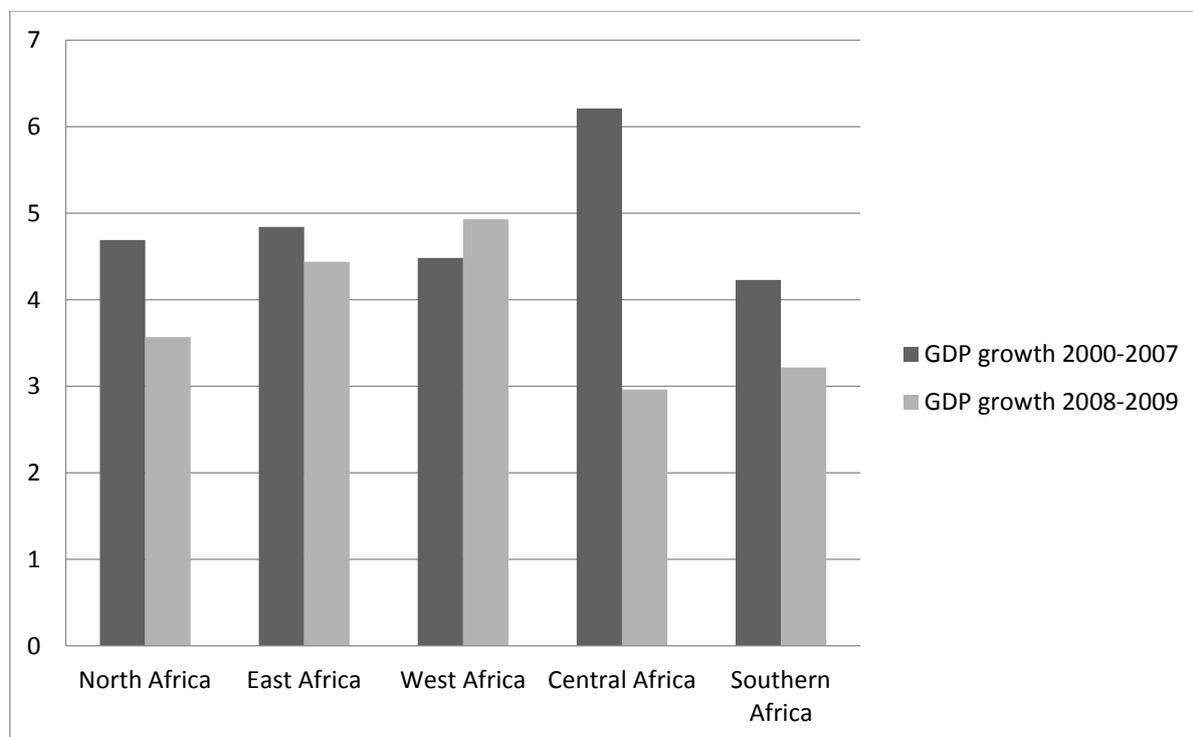
Source: World Development Indicators

Figure 2: African growth versus advanced growth: Before and during the credit crunch



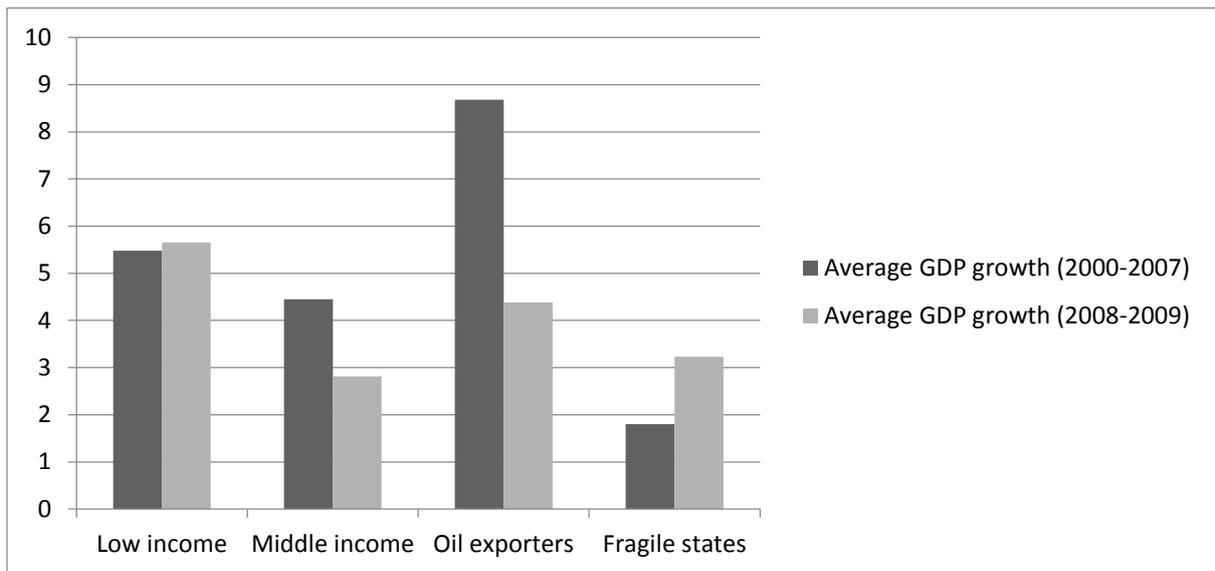
Source: World Development Indicators

Figure 3: African GDP growth by region, 2000-2009



Source: African Development Indicators

Figure 4: African GDP growth by group, 2000-2009



Source: African Development Indicators