Do Currency Unions Deliver More Economic Integration than Fixed Exchange Rates? Evidence from the CFA and the ECCU

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Abstract
In this paper we develop a model to identify determinants of macroeconomic integration in the African CFA Franc Zone and in Dollar-pegging Caribbean countries (including members of the East Caribbean Currency Union). These two groups of countries each comprise states using several different local currencies: on the one hand the BCEAO-CFA Franc and the BEAC-CFA Franc (both pegged to the Euro), on the other the ECCU Dollar and other national Dollar-pegged currencies. The purpose of the analysis is to distinguish the effect of monetary union on macroeconomic integration from the effect of pegging to a common OECD currency.

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1. Introduction

Over the last decade, many countries have chosen to adopt "hard" exchange rate pegs, or to become part of an international monetary union (Ghosh *et al.*, 1995). These changes have renewed academic interest in the impact of the exchange rate regime and monetary union on international macroeconomic integration. Papers such as Artis and Zhang (1995), Christodoulakis *et al.* (1995), Fatas (1996) and Boone (1997) examine the impact of exchange rate pegs on the magnitude of business cycle correlations. These studies on the magnitude of the correlation of shocks run parallel to a literature on the impact of exchange rate regimes on the persistence of asymmetric shocks, and in particular on the persistence of deviations from PPP (for example, Lothian and Taylor, 1996, Papell, 1997 and Engel and Rogers, 2001). Evidence on the impact of complete monetary union is necessarily more limited – given the small number of countries that have adhered to a monetary union for any length of time – but Rose and Engel (2000) look at their impact on business cycle correlations and trade.

Overall, there appears to be some evidence to confirm the conjecture (as in for example Obstfeld and Rogoff, 1996) that sharing a common currency, or alternatively adopting a hard exchange rate peg with one's main trading partner, reduces international transactions costs and exchange rate risk, which promotes greater trade and hence also greater business cycle synchronicity. It also appears to insulate partner countries from speculative bubbles that lead to temporary and unnecessary fluctuations in the real exchange rate. However, there is some disagreement about the robustness of these results, as exemplified by the debate between Rose (2001) and Persson (2001). One worry is that evidence based on linear regression equations that incorporate an exchange rate regime dummy might suffer from bias because such equations do not adequately capture nonlinearities in the process determining the level of integration.

Whatever the strength of the results published so far, none of these papers directly addresses the question of whether the impact of full monetary union on macroeconomic integration differs from that of adopting a hard peg. This is of potential policy importance, because for some countries the administrative or political costs of joining a monetary union may be prohibitively high. If adopting a hard peg is a close macroeconomic substitute to complete monetary integration, the benefits of such integration are likely to be available to a wider range of nation states.

Indeed, existing empirical papers provide very ambiguous evidence about the role of hard pegs versus the role of currency unions. Apart of the Europe-specific papers (none of which provides direct evidence on the impact of full monetary union, given the short time the EMU has been in existence), a substantial part of the international evidence relies on the inclusion of observations from the world's two long-lasting trans-national common currency areas: the CFA Franc Zone in Africa and the East Caribbean Currency Union (ECCU). In panel and cross-section studies, these areas provide the bulk of observations for *both* fixed exchange rate regimes *and* monetary unions.[1]

Using these currency areas as the basis for empirical evidence leaves to one side a potentially important point. The integration benefits to a small open economy from adhering to a currency union might arise not so much from the shared currency as from the common peg. So, for example, the increased integration between Puerto Rico and the Bahamas resulting from their dollarization, or between St. Lucia and Dominica resulting from their common use of the ECCU Dollar (which is pegged to the US Dollar), may be no greater than their integration with Barbados (which maintains a conventional peg against the US Dollar). The existing results from francophone countries are even more ambiguous. Typically, the CFA has been treated as a single currency union, when in fact it comprises two quite separate currencies, each issued by a different central bank and *separately* pegged to the French Franc (and now to the Euro). So, for example, Togo and Gabon (in different currency areas within the CFA) have been treated as members of the same currency union, but Togo and Mayotte (which uses the French Franc) have not. In fact, all three countries use different currencies, each exchangeable with the others at a fixed rate.

This paper will address these ambiguities by looking at the degree of macroeconomic integration between countries in two areas of the world. First, we will examine pair-wise measures of integration between the nations of the CFA, all of which use one currency or another called the CFA Franc and pegged to the French Franc / Euro. Some of the pairs are made up of economies within the same monetary union, and others are cross-union pairings. Second, we will look at the same measures for a group of Caribbean countries, all of which use currencies pegged to the US Dollar. Some are members of the ECCU, some have dollarized national currencies and others maintain conventional independent pegs.

The purpose of the comparisons is to see whether adhering to a common currency delivers a degree of integration over-and-above that resulting from adherence to a common peg. Some of the theoretical explanations for greater integration are based on currency transactions costs, and suggest that integration arises from full monetary union, rather than from a common peg. Others are based on exchange rate volatility and exchange risk, and suggest that (credible) adherence to a common peg might suffice.[2]

[1] For example, the data set employed by Rose and Engel (2000) includes 256 pairs of countries identified as sharing a currency, of which 120 are CFA or ECCU pairs. A further 116 are US Dollar or French Franc pairs.

[2] Even if the marginal effect of a common currency over a common peg is negligible, some countries might be able to adhere credibly to a peg only within a monetary union, because of the political fragility of domestic monetary

The next section provides a brief, non-technical survey of the possible reasons why monetary union might affect the degree of international economic integration. We will focus on three aspects of integration: trade intensity, the magnitude relative price volatility, or of deviations from PPP, and the degree of business cycle synchronization. Section 3 introduces the countries that will appear in our analysis. Section 4 then discusses the econometric framework that will be used in Section 5 to measure the degree of integration. The aim is to build a modelling framework based on realistic assumptions about the structure of the small open economies that form our sample, a structure rather different than that of the typical OECD economy.

2. Monetary Union and Economic Integration

The existing literature suggests at least three aspects of international economic integration that could in principle be affected by membership of a monetary union as opposed to a fixed exchange rate.

(i) The use of a common currency will eliminate transactions costs in international trade (De Grauwe, 2000), so trade volumes ought to increase. For one of the two regions we will be examining – the ECCU – this aspect of integration is not really relevant. Most of the Caribbean countries specialize in tourism and (to a lesser extent) cash crop production: areas in which there is little scope for intra-regional trade. Trade within the region makes up less than 10% of the total trade volume. For the CFA, however, intra-regional trade is much more important. Trade between CFA countries and other LDCs makes up a substantial fraction of the total trade volume (in some cases, more than 50%: see Table 1).

(ii) Engel and Rogers (2001) identify a number of factors that determine the degree of real exchange rate volatility between pairs of countries. Nominal exchange rate volatility and physical distance turn out to be important factors, but there is also a substantial "pure" border effect. Controlling for all other factors, the ratio of prices in two regions is more volatile if the regions are located in different countries. Engel and Rogers suggest a number of explanations for this effect. Some of these, including the currency transactions costs mentioned above, but also factors such as international heterogeneity

institutions. So monetary union can still be a significant factor in international integration, even if the only economic consequences of monetary union are those arising from the common peg. The political economy of monetary union is, however, beyond the scope of this paper.

in marketing and distribution systems, the scope for international price discrimination, or "informal" trade barriers, might be reduced if the countries shared a common currency.[3]

(iii) As a consequence of increased trade, the degree of business cycle synchronicity between two countries in a monetary union might be higher, because aggregate demand shocks in one country have more of an impact on the other than they would otherwise; or it might be lower, because increased trade corresponds to increased specialization in types of production subject to different productivity shocks. But an increased volume of bilateral trade is not the only way in which a common currency could affect business cycle synchronicity. For example, if multinational firms have less scope for price discrimination between members of a monetary union (because price differences are more transparent and because the elimination of currency transactions costs facilitates arbitrage in goods), then international productivity shocks are likely to be passed on to local markets in a more uniform way.

[Table 1 here]

In this paper we will use data from our two regions to assess the extent to which membership of the same monetary union influences the degree of international macroeconomic integration, over and above a fixed exchange rate effect. We will measure integration in terms of (i) trade volumes (in the CFA only), (ii) real exchange rate volatility and (iii) business cycle synchronicity. The precise measures used will be discussed in Section 4.

3. Monetary Union in Africa and the Caribbean

3.1 The CFA Franc Zone

The CFA evolved from the monetary institutions of the last phase of French colonial Africa. Figure 1 shows a map of the CFA region. It comprises two monetary areas, each with its own currency and central bank: the West African Economic and Monetary Union (UEMOA), using currency issued by the Central Bank of West African States (BCEAO); and the Central African Economic Area (UDEAC), using currency issued by the Bank of Central African States (BEAC). Both currencies are commonly called the CFA Franc, although they are entirely separate monetary units.

The countries that make up the CFA, and their basic economic structure, are summarised in Tables 2-3. The boundaries between the different monetary areas have a geographical and historical basis, and each of the two monetary unions (the BCEAO and BEAC regions) comprises a wide range of economies. The BCEAO region includes both semi-industrialised economies with a high export-

[3] For example, traders' lives will be made easier if they only have to hold one type of currency with which to bribe customs officials.

GDP ratio (such as Cote d'Ivoire and Senegal) and also some of the world's poorest and underdeveloped countries (such as Burkina Faso and Mali). The BEAC region includes both countries that are equally underdeveloped (Chad, Central African Republic and Equatorial Guinea) and relatively high-income petroleum exporters (Cameroon, Congo Republic and Gabon).

Each of the two currencies is exchangeable for the French Franc at a rate of 100:1 (and now at the equivalent Euro rate). The French Treasury is obliged to exchange CFA Francs for Euros at this fixed rate,[4] and there are rules limiting CFA government borrowing that are intended to prevent the African countries from abusing France's guarantee of convertibility. However, France is not part of the CFA, and the only legal tender in each CFA country is the currency issued by its central bank. Foreign currency (including the other CFA currency) is not used as a unit of account or medium of exchange. Commercial banks do not typically offer customers foreign currency deposit facilities, and foreign currency deposits are a negligibly small fraction of total deposits. The exchange of one CFA currency for another (or of CFA Francs for Euros) must be conducted through the central bank and, and is subject to taxation, so intra-CFA currency transactions costs are not negligible (Vizy, 1989).

[Figure 1 and Tables 2-3 here]

The composition of the two monetary unions is a consequence of the French colonial organisation, and is therefore exogenous to contemporary economic characteristics. The current grouping into two currency areas dates from 1955 (seven years before full political independence, at which point the countries were self-governing French overseas territories), and arises from the distinction between French West Africa and French Equatorial Africa in the colonial period. As can be seen from the map, this division is based on the physical geography of the region. The only point of physical contact between the UEMOA and the UDEAC is the Chad-Niger border, which lies in the Sahara Desert far from any major centers of population. Further south, the two areas are separated by Nigeria, a former British colony that has no part in the CFA. The CFA comprises those Sub-Saharan African countries occupied by France at the end of WW1.[5] There have been just two exits from the CFA, neither of which is likely to have been correlated with the countries' economic characteristics. In 1958, at the institution of the Fifth French Republic, all overseas territories participated in a referendum on the new constitution. Guinea-Conakry, which happened to have a socialist government at the time, was the only colony to reject this constitution, and severed all political and financial links with France. In 1973, after full independence, Mauritania (the only Arab country in the area) also exited the CFA, preferring to pursue an identity as a North African Arab state. There have also been just two entries: Equatorial Guinea and Guinea-Bissau. These countries were, respectively, Spanish and Portugese

[4] In effect, France pegs the Euro to the CFA currencies. Monetary policy in the CFA is constrained not by the need to maintain an exchange rate peg, but by (very lax) rules limiting domestic credit creation.

colonies; they are completely surrounded by, respectively, UDEAC and UEMOA nations, and joined the appropriate monetary union in 1985 and 1997. The only other countries surrounded by the CFA (Gambia, Ghana, Liberia, Nigeria and Sierra Leone) are all English-speaking. All but Liberia were British colonies, and up until now it has been made clear that they are not welcome to join the francophone monetary area.

In this paper we will focus on those 12 of the 14 members of the CFA for which adequate macroeconomic data are available: Benin (designated *ben* in the tables), Cote d'Ivoire (*civ*), Mali (*mli*), Niger (*ner*), Senegal (*sen*) and Togo (*tgo*) in the BCEAO area and Cameroon (*cam*), Central African Republic (*car*), Chad (*tcd*), Congo Republic (*cgo*) and Gabon (*gab*) in the BEAC region.[6] If sharing a common currency delivers an additional degree of integration over-and-above that arising from the common currency peg, then we should see a greater degree of integration within each of the two monetary unions than we do across the BCEAO-BEAC border, conditional on other, exogenous economic characteristics.

3.2 The ECCU and other Dollar-pegging Caribbean countries

The East Caribbean Currency Union is made up of eight island economies. Adequate data are available for the analysis of macroeconomic shocks in six of these: Antigua and Barbuda (*atg*), Dominica (*dma*), Grenada (*grd*), St. Kitts and Nevis (*ktn*), St. Lucia (*lca*) and St. Vincent and the Grenadines (*vct*).[7] As with the CFA, this currency union owes its existence to colonial history: the member states formed Britain's colonial possessions in the Eastern Caribbean. Spanish and French-speaking islands are excluded. Members share a single central bank issuing the ECCU Dollar, pegged to the US Dollar at a fixed rate. Proximity to the USA and a large amount of tourism mean that US Dollars also circulate in these countries. However, the use of the ECCU Dollar as a unit of account and as a medium of exchange by all of the (sizeable) public sectors institutions across the islands ensures that the domestic private sector must deal largely in the local currency. In December 2000, for example, private sector foreign currency deposits in the ECCU made up only 15.7% of total private sector bank deposits. This is not significantly different from the equivalent figure for OECD countries: the ratio for Great Britain in the same period was 13.3%.[8] The ECCU-US$ exchange rate has remained fixed for many years, but re-pegging is not impossible. Indeed, the currency was originally pegged to UK Sterling. In this sense, membership of the ECCU does not entail a currency union with the USA, and the ECCU countries are not dollarized.

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[5] Excepting Djibouti, which is thousands of miles away in the Horn of Africa.

[6] The two countries lacking adequate data are Guinea-Bissau in the BCEAO region and Equatorial Guinea in the BEAC region.

[7] The two other ECCU members are Aruba and Montserrat.

[8] The figures come from the central bank websites: www.eccb-centralbank.org and bankofengland.co.uk.

Many other Caribbean countries have maintained a peg against the US Dollar at one time or another. However, there are just two sizeable economies that have avoided a flexible exchange rate regime from independence through to the 21st century: the Bahamas (*bhs*), and Barbados (*brb*), plus two Central American economies: Belize (*blz*) and Panama (*pan*). In the case of the Bahamas and Panama, the fact that the peg has been retained for so long is a result of geo-political factors,[9] and the two countries are completely dollarized, with no separate currency of their own. Barbados and Belize have maintained conventional fixed pegs against the US Dollar. If sharing a common currency delivers an additional degree of integration over-and-above that arising from the common currency peg, then we should see a greater degree of integration within the ECCU than we do between ECCU countries and the other four countries, conditional on other, exogenous economic characteristics.

Note that we will not be looking at the degree of integration between each of the small open economies and the large economy issuing the anchor currency. Our econometric methodology is based on the assumption that foreign prices are exogenous, an assumption valid only for a small open economy.

4. Testing for the Marginal Effect of Adhering to a Common Currency

Our basic methodology is similar to that of Rose and Engel (2000), but with different dependent variables and a different data set. The extent of macroeconomic integration between two countries might depend on a variety of factors other than their currency institutions. So our approach is to construct a fixed-effects regression for different measures of integration in any two countries i and j, conditional on both a common currency dummy (ifs_{ij}) and a set of exogenous conditioning variables.

In the empirical section that follows we will employ four different measures of integration. The first is the total value of bilateral trade between two countries, in millions of dollars (T_{ij}). This corresponds to integration concept (i) in Section 2. T_{ij} ought to be higher in countries sharing the same currency. The second, in the spirit of Engel and Rogers (2001), is a measure of unconditional real exchange rate volatility, that is, the standard deviation of the (log) ratio of annual consumer price indices in i and j over the period for which data are available (S_{ij}). This corresponds to integration concept (ii) in Section 2. S_{ij} ought to be lower in countries sharing the same currency.

However, one might question whether this unconditional measure of volatility is the most appropriate for our purposes. In the short run (i.e., over a period shorter than that in which arbitrage guarantees PPP), prices could vary in response to a wide variety of macroeconomic factors. For example, in the CFA the two different central banks can each pursue an active monetary policy.

[9] Panama shared a land border with the USA until the latter ceded the Canal Zone in 2000; the Bahamas are only a few miles from the coast of Florida.

Interest parity with France does not hold in the short run, and the differential between each central bank's base rate and that of the European Central Bank varies over time; so does the differential between the interest rates in the two parts of the CFA. The Euro-CFA Franc peg is guaranteed by the French Treasury, so short-run monetary policy in the CFA is not constrained by the need to maintain the peg. Idiosyncratic innovations in monetary policy could generate price deviations. Two countries in different currency areas might exhibit a large degree of unconditional real exchange rate volatility not because using different currencies creates underlying structural asymmetries, but just because the two monetary authorities are following different policies. Conditioning out the monetary shocks might give a more informative indicator of the degree of underlying macroeconomic integration.

So an alternative way of measuring the degree to which prices in two countries are tied together is to estimate the size of annual price changes conditional on short-run factors like changes in the money supply, and then to look at the extent of correlation between the price innovations in two countries. In other words, we need a macro-econometric model incorporating a real exchange rate equation. In the case of the CFA, such a model is provided by Fielding and Shields (2001), who construct a structural VAR model that provides estimates of the innovations in domestic prices in CFA countries, conditional on growth in output, money and foreign prices.[10] We use these estimates for our CFA sample; we also replicate the model with Caribbean country data. For the sake of brevity, we do not discuss the model in detail here. Its econometric rationale is similar in spirit to that of Blanchard and Quah (1989), but with a different underlying economic structure, based on assumptions that are more realistic for a small open economy. We assume that in the long run, inflation rates in the each country in the CFA will converge on French inflation,[11] and inflation rates in each Caribbean country on US inflation. However, short run movements in real output and in the money supply can generate fluctuations in prices around the level consistent with PPP with OECD countries. In addition to these fluctuations, there are also short-run innovations in domestic prices, estimated as forecast errors in the model. If sharing a common currency ties countries' prices together more closely than does a fixed exchange rate (conditional on money and output shocks), then these innovations should be more closely correlated between members of a monetary union than they are between countries that just happen to peg to the same OECD currency. The innovation correlation coefficient, $\sigma_{ij}^{\Delta p}$, is our third measure of integration.

The econometric model is also used to construct the fourth measure of integration: the degree of business cycle synchronicity, corresponding to concept (iii) in Section 2. Here we are concerned with the measurement of the extent to which aggregate supply and aggregate demand

[10] However, this paper does not explore the factors that might explain the cross-country correlations in price innovations.

shocks in one country are passed on to another. Again, we wish to condition on monetary policy: in the long run, money is neutral, but in the short run money shocks can impact on output. So the output shocks are measured as innovations in the output equation in the model. The correlation coefficient for this second type of innovation, $\sigma_{ij}^{\Delta y}$, is our fourth measure of integration.

5. Empirical Results

This section is divided into three parts. The first presents the results of estimating equation (1) using the trade intensity measure of integration (measure i in Section 2); the second presents the results of using unconditional real exchange rate volatility (measure ii); the third presents the results of using the estimated price and output innovation correlations (measures iii and iv).

We have two samples for use with the four alternative dependent variables. The first is made up of the 66 country pairs among the 12 CFA countries. The second is made up of the 45 country pairs among 10 Caribbean and Central American countries. In the CFA sample, ifs_{ij} = 1 in 31 cases (when both countries are in the BCEAO area, or both are in the BEAC area); in the Caribbean sample, ifs_{ij} = 1 in 15 cases (when both countries are ECCU members). The data used to construct the conditioning variable (i-iv in Section 3) are taken from the World Bank *World Development Indicators*.

5.1 The impact of a common currency on trade intensity

In this case, we present results only for the CFA sample, since the volume of trade among the Caribbean countries is a very small fraction of their total trade. The regression for trade intensity is based on an equation of the form:

$$\ln(1+T)_{ij} = f(D_i, D_j, ifs_{ij}, X_{ij}) + u_{ij} \quad \textbf{(1)}$$

u_{ij} is a residual, and X_{ij} a vector of conditioning variables. D_i is a dummy variable for the i^{th} country. It turns out that country-specific effects have a large part to play in predicting trade intensity, and it might not necessarily be the case that the economic characteristics contained in the *X*-vector fully capture these effects. In other words, we will allow for unobserved country-specific characteristics to affect T_{ij}. These characteristics might incorporate a range of factors. For example, Rose and van Wincoop (2001) and Anderson and van Wincoop (2001) suggest that it is important to take account of the magnitude of each country's barriers to trade with all its trading partners, a factor difficult to measure in our sample of countries with very limited fiscal data.

[11] Evidence for this is cited in Fielding and Shields (2001).

The *X*-vector comprises a number of economic characteristics. To the extent that integration is a function of the volume of bilateral trade flows, the explanatory variables in "gravity" models of international trade will enter into *X*:

(i) The log-product of the two countries' total initial GDP (in US Dollars): $y_i \cdot y_j$

(ii) The log-product of their initial *per capita* GDP (in US Dollars): $y^P{}_i \cdot y^P{}_j$

(iii) The log-product of their land surface areas (in km^2): $a_i \cdot a_j$

(iv) A dummy variable for whether the countries share a land border: ifb_{ij}

(v) The logarithm of the Great Circle distance between their capital cities (in radians): $dist_{ij}$

(vi) A dummy variable for whether the two countries have a maritime coastline: ifc_{ij}

Figures for (i-iii) are taken from the World Bank *World Development Indicators*. However, these conditioning variables might also affect the magnitude of macroeconomic integration for other reasons. For example, larger or more developed countries might be less susceptible to speculative behavior that induces unanticipated deviations in the real exchange rate; so real exchange rate volatility might be lower. In this paper, we do not attempt to identify the channels through which the conditioning variables impact on our macroeconomic integration measures.

The ifs_{ij} dummy appears in equation (1) in order to capture the possibility that sharing a common currency (rather than just having a fixed exchange rate) reduces transactions costs in international trade, as outlined in section 2 above. In this sense, it has a role similar to the variables in the equation reflecting the determinants of international transport costs: ifb_{ij}, $dist_{ij}$ and ifc_{ij}. A simple version of equation (1) might treat the four cost variables as linearly separable arguments of *f()*. However, in the light of comments by, for example, Persson (2001), the linearity assumption is questionable. The magnitude of the impact of a common currency on trade between two countries could depend on the size of transport costs, if only because larger transport costs could increase the size of the currency transactions involved, *ceteris paribus*. But also, the magnitude of informal barriers to trade might depend on the two elements of costs – for transport and for currency transactions – in a more complex way. For this reason, a more appropriate form of equation (1) will include terms interacting ifs_{ij} with the other cost variables:

$$\begin{aligned} \ln(1+T)_{ij} &= \theta_i D_i + \theta_j D_j + \beta_1 y_i y_j + \beta_2 y_i^P y_j^P + \beta_3 a_i a_j + \eta_1 ifs_{ij} + \eta_2 ifb_{ij} + \eta_3 dist_{ij} + \eta_4 ifc_{ij} \\ &+ \gamma_1 [ifs_{ij} \cdot dist_{ij}] + \gamma_2 [ifs_{ij} \cup ifc_{ij}] + u_{ij} \end{aligned} \qquad \textbf{(1a)}$$

where $ifs_{ij} \cup ifc_{ij}$ = 1 if either ifs_{ij} = 1 or if ifc_{ij} = 1 and zero else. ifs_{ij} is not interacted with ifb_{ij} because there is only one case of a land border between a UEMOA country and a UDEAC country

(Niger and Chad). Of course, we do not know *a priori* whether we have successfully captured all the relevant non-linearities in this way. So testing the validity of this functional form will be an important part of the econometric exercise.

[Tables 4-5 here]

The regression results are presented in Table 4. For each explanatory variable, the estimated coefficient is reported alongside the corresponding standard error (using White's correction for heteroskedasticity), "h.c.s.e.", the resulting t-ratio and the corresponding partial R^2. In these regressions the T_{ij} figures used are taken from IMF *DOTS* for 1997. The table includes two regression equations. The first is the unrestricted equation (1a); the second is a more parsimonious form in which some conditioning variable coefficients have been set to zero so as to minimize the Akaike Criterion. (This criterion, AIC, along with the Schwartz and Hannon-Quinn Criteria, SC and HC, is reported at the bottom of the table.) Those coefficients that are statistically significant in the unrestricted equation do not change substantially in the restricted one, so we are reasonably confident that our inferences are robust to the inclusion of nuisance parameters in the model. Table 5 includes a test for the validity of the functional form that we have chosen. This is a Ramsey RESET test for adding powers of the fitted residuals up to the fourth order to the regression equation. In neither the unrestricted nor the restricted version of the equation can we reject the null that the functional form we have chosen is an adequate description of the data.

The table shows that the most important factor explaining trade intensity, aside from country fixed effects, is whether two countries share a land border. The point estimate in the unrestricted equation is 1.53. That is, countries sharing a land border have a volume of trade that is over 150% higher than trade with more distant countries, *ceteris paribus*. There is also a negative coefficient on the distance variable (-0.68), and a positive coefficient on the *per capita* income variable (0.61), although these become statistically significant only in the restricted equation.

Finally, there is a positive coefficient on the interaction term $ifs_{ij} \cup ifc_{ij}$ that is significantly different from zero, but not from unity. In other words, if two countries either both have a coastline or both share the same currency, their trade volume is about twice as high as otherwise. Neither ifs_{ij} alone nor ifc_{ij} alone has a significant impact on trade. One interpretation of this effect is that using a different currency is a substantial barrier to trade in landlocked countries only. Landlocked countries rely on their maritime neighbours – neighbours in the same currency area – for the transportation of imports and exports. The inland countries generally face higher transport costs. It seems that the combination of currency transaction costs and relatively high transport costs is enough to inhibit trade, but either of these two effects alone is not in itself large enough to have a significant impact on trade volumes. In other words, the benefit of sharing a single currency, over and above any benefit of a fixed exchange rate, depends on geographical location.

5.2 The impact of a common currency on unconditional real exchange rate volatility

In this section we discuss the results of the corresponding regression equations for the real exchange rate volatility measure, S_{ij}. For this measure of integration, we require a different regression equation with different conditioning variables. The degree of variation in relative prices across two countries is likely to depend on the degree of heterogeneity in their production structures, and the degree of correlation in the external price shocks that they face. It might also depend on their geographical proximity, if variations in local prices depend on variations in local climate, or if the strength of international commodity arbitrage in the short run depends on transportation costs between markets. So our regression equation is of the form:

$$\begin{aligned} S_{ij} &= \theta_i D_i + \theta_j D_j + \beta_1 f(|g_i - g_j|) + \beta_2 f(|d_i - d_j|) + \beta_3 f(ctot_{ij}) \\ &+ \eta_1 ifb_{ij} + \eta_2 dist_{ij} + \eta_3 ifc_{ij} + \eta_4 ifs_{ij} + u_{ij} \end{aligned} \qquad \textbf{(2)}$$

S_{ij} is measured as a standard deviation using the time-series price data described in Section 5.3. g_i is the ratio of agricultural value added to GDP in country i, d_i is the ratio of industrial value added to GDP, and the transformation $f(x) = log(1+x) - log(1-x)$ ensures that the explanatory variables are approximately normally distributed. $ctot_{ij}$ is the correlation of the terms of trade in country i with that in country j. All figures are based on annual data for 1970-1999 from the World Bank *World Development Indicators*. In the light of the discussion in section 2 above, it is also conceivable that S_{ij} will depend on T_{ij}; however, the trade variable was never statistically significant in IV estimates of equation (2). Again, it will be important to test for the validity of this functional form.

[Table 6 here]

Table 6 reports the regression results using S_{ij} as the dependent variable. The first half of the table relates to the regression equation for the CFA zone; the second half relates to the regression equation for the ECCU and its neighbors. The table shows that in the first case (the CFA), the only significant factors (other than fixed effects) is the monetary union dummy ifs_{ij}. The estimated coefficient on the monetary union dummy is –0.3, so countries sharing the same currency can be expected to have a standard deviation of relative prices that is about 30% lower, *ceteris paribus*. The RESET test statistics in Table 5 indicate that there are no substantial non-linearities biasing these results: the size of the monetary union effect does not depend on other economic characteristics.

The same cannot be said for the ECCU sample. When a regression taking the form of equation (2) was fitted to the Caribbean data, the RESET test statistics was greater than the 5% critical value.

The reason for this is that in the Caribbean the size of the single currency effect depends on the distance between the two countries: there is a large and statistically significant coefficient on the interaction term $ifs_{ij} \cdot dist_{ij}$. Once such a term is added to the regression equation, there is no other sign of non-linearity. Table 6 therefore reports the amended version of the equation. The estimated coefficients imply that a 10% increase in distance increases the standard deviation of relative prices by a factor of 0.074, if the two countries use different currencies. If, however, the two countries are part of the ECCU, the increase is only by a factor of 0.02 (which is not significantly different from zero). In addition, at any given distance, ECCU membership reduces the standard deviation of relative prices by a factor of 1.50. Differences in economic structure, as captured by $|d_i - d_j|$ and $|g_i - g_j|$, appear not to matter in the Caribbean. When Caribbean countries share a single currency, they avoid the asymmetries in price movements that are usually associated with greater distance. One explanation for this effect might be that the monetary union, either through lower currency transactions costs, or through proactive policy, mitigates the weakening of international arbitrage in goods as distance increases.

One drawback of the exchange rate volatility measure S_{ij} is that it does not control for the fact that members of a monetary union may happen to have experienced common shocks to aggregate demand that increase the correlation of prices, but do not reflect a greater degree of underlying integration. For this reason, we now turn to the analysis of our second price volatility measure, $\sigma_{ij}^{\Delta p}$.

5.3 The impact of a common currency on price and output innovation correlations

In this sub-section we will present estimates of cross-country correlations of the innovations to prices and output, $\sigma_{ij}^{\Delta p}$ and $\sigma_{ij}^{\Delta y}$, for both the CFA and the ECCU and its neighbors. The innovations have been derived from a structural VAR incorporating three dependent variables, Δp (the growth rate of the consumer price index), Δy (the growth rate of real GDP at market prices) and Δm (the growth rate of M1), conditional on the exogenous rate of growth of foreign prices. Annual data for these variables are taken from the World Bank *World Development Indicators*. The annual data run from 1966 to 1997. Fitting this model to the data facilitates the recovery of structural innovations in Δp and Δy, conditional on shocks to money growth and foreign prices. In other words, we can estimate that part of shocks to output and prices that is not to do with idiosyncratic monetary policy or exogenous shocks to international prices. To the extent that adhering to a common currency delivers extra insulation from real exchange rate fluctuations (over-and-above that provided by a common peg), we ought to find that pairs of countries using a common currency exhibit a higher $\sigma_{ij}^{\Delta p}$ than pairs using different currencies, and greater similarity in the dynamic response to the price innovations. To the extent that adhering to a common currency delivers extra macroeconomic integration, the same ought to be true of $\sigma_{ij}^{\Delta y}$. First of all, we present descriptive statistics on real exchange rate and output shocks in the CFA and the Caribbean. Then we construct formal tests of the hypotheses above.

5.3.1 Estimation and description of price and output shocks in the CFA

Table 7 shows the cross-country correlation coefficients for the estimated innovations to Δp and Δy.[12] These are the variables $\sigma_{ij}^{\Delta p}$ and $\sigma_{ij}^{\Delta y}$ to be used in our cross-country regressions. In the correlation matrix, the Δp correlations are shown below the main diagonal and the Δy correlations above. The Δp innovations are typically very highly correlated across all of the CFA, even across the BCEAO-BEAC border. Most are significantly greater than zero at the 1% level. So, for example, the correlation coefficient for real exchange rate shocks to the Central African Republic (*car*) and Senegal (*sen*) is 97%.

We will leave until later the question of whether the correlations within the BCEAO region and within the BEAC region are greater than those across the two currency areas, conditional on each country's economic characteristics. But a cursory glance at Table 7 reveals that some countries have significantly lower correlation coefficients with *all* other CFA members, regardless of the currency they use. As Table 8 indicates, there is a "core" group of 8 CFA members (Cote d'Ivoire, Senegal, Togo and Mali in the BCEAO region; Cameroon, Congo Republic, Gabon and the Central African Republic in the BEAC region) whose average value of $\sigma_{ij}^{\Delta p}$ is 92%. If the group is expanded to incorporate the other four CFA members (Benin, Burkina Faso and Niger in the BCEAO region and Chad in the BEAC region), then the average correlation coefficient falls to 76%. In other words, there are substantial country-specific factors affecting the degree of correlation in addition to any effect of sharing a common currency.

[Tables 7-8 here]

Table 7 also lists correlation coefficients for the output innovations. These exhibit rather more heterogeneity than the real exchange rate shocks. As indicated in Table 8, there are two groups of countries within which correlations are positive and reasonably large. These are (i) the BCEAO countries Benin, Burkina Faso, Senegal, Togo, and Niger, plus the BEAC countries Cameroon, Gabon, Central African Republic and Chad; (ii) the BCEAO counties Cote d'Ivoire and Mali, plus the BEAC country Congo Republic. However, all correlations across these two groups are *negative*. Again, country-specific effects play a large role in predicting the size of correlations. It remains to be seen whether membership of the same monetary union has any marginal impact on these correlation coefficients. Moreover, country-specific effects for output shocks differ from country-specific effects for real exchange rate shocks: the membership of the core price groups in Table 8 cuts across the core

[12] In the case of the CFA, the figures in Table 7 are taken from Fielding and Shields (2001).

output groups. This is not inconsistent with possible explanations for the degree of correlation between output shocks on the one hand and real exchange rate shocks on the other. For example, the degree of similarity in real exchange rate shocks might be dominated by the extent of price inertia. (The four real exchange rate "outsiders" are all among the most underdeveloped countries in the CFA; three are in the Sahel.) The degree of similarity in output shocks might be dominated by completely different factors, such as the structure of production. But it does suggest that adherence to a common currency is by no means the only factor driving the size of $\sigma_{ij}^{\Delta p}$ and $\sigma_{ij}^{\Delta y}$.

5.3.2 Estimation and description of price and output shocks in the Caribbean

Figures for Δp and Δy in the Caribbean countries are taken from the World Bank *World Development Indicators*. The number of the annual observations available varies from one country to another, with the earliest reported figures in 1960 and the latest in 2000. However, there are at least 30 observations for all 10 countries.

The bottom part of Table 7 shows the sample cross-country correlation coefficients for the estimated structural innovations to Δp and Δy. In the correlation matrix, the Δp correlations are shown below the main diagonal and the Δy correlations above. The Caribbean $\sigma_{ij}^{\Delta p}$ values are typically rather smaller than the corresponding CFA ones, even when the sample is restricted to the ECCU countries alone. Overall, this is a more heterogeneous group than the African one. As shown in the bottom half of Table 8, there is a core of 5 countries for which the average real exchange rate innovation correlation is 52%: Antigua, Dominica and Grenada in the ECCU, plus Barbados and Belize outside. Adding in St. Kitts and Panama reduces the average to 38%; adding in the other three countries reduces the average even further. In other words, there is a substantial amount of unanticipated real exchange rate variation across the Caribbean countries, as well as between each country and the USA. Again, country-specific effects appear to be important. Moreover, the degree of correlation of real exchange rate shocks for the ECCU as a whole is substantially less than the corresponding degree of correlation in the CFA area.

These remarks are also true of the estimated output innovation correlations. If one excludes Panama, then the average correlation coefficient for the remaining 9 countries is greater than zero, but only 30% of the individual coefficients are statistically significant. Even within the ECCU, there are many pairs of countries with negative or insignificant correlations. Still, we have yet to see whether adhering to the ECCU has a marginally positive impact on the degree of correlation, *ceteris paribus*.

Neither is there an obvious pattern relating the size of the cumulative impulse responses to membership of the ECCU (bottom half of Table 8). In the first column, for example, there are both ECCU and non-ECCU countries with relatively small cumulative impulse responses (for example, Grenada and Belize), and both ECCU and non-ECCU countries with relatively large responses (for example, Antigua and the Bahamas). The middle column, representing the cumulative impact of shocks to the real exchange rate on output, shows positive responses in some of the ECCU and non-ECCU countries, and negative responses in others. As in the CFA, country-specific effects appear to dominate any monetary union effect in inducing similarity in dynamic responses to shocks.

5.3.3 Estimates of the impact of a common currency on innovation correlations

For each sample we estimate two regressions of the form given in equation (2), one for $\sigma_{ij}^{\Delta p}$ and one for $\sigma_{ij}^{\Delta y}$. The regression results are reported in Tables 9-10. We use logistic transformations of the correlation coefficients, so that the distributions of the dependent variables are unbounded.

The first parts of the two tables report the CFA regressions. For $\sigma_{ij}^{\Delta p}$ the regression results are rather different from those for S_{ij}. There are two differences between the equations. First, the border dummy ifb_{ij} is significant in the $\sigma_{ij}^{\Delta p}$ regression. Countries sharing a common border have higher values of $\sigma_{ij}^{\Delta p}$. The point estimate on the dummy is 0.18. In other words, neighboring countries can be expected to have a conditional price correlation that is about 18% higher than for more distant country pairs. Secondly, the monetary union dummy ifs_{ij} is statistically insignificant in the $\sigma_{ij}^{\Delta p}$ regression. In other words, if we condition out that part of price changes due to exogenous shocks to foreign prices, or to shocks to domestic money supply and output, the correlations in price changes across countries do not depend on whether two counties are part of the same monetary union. As we will see below, cross-country correlations in output shocks are independent of ifs_{ij}, and the foreign price shocks are common to all CFA countries. So the reason for the difference between the two equations lies in the monetary shocks. Price movements in countries within a monetary union are more highly correlated with each other than they are with price movements in the countries of the other union; but this appears to be largely because countries within a monetary union are subject to a single central bank with a single monetary policy. There is no evidence for "deeper" market integration within a union.

We find a similar phenomenon in the Caribbean sample. The non-linear combination of $dist_{ij}$ and ifs_{ij} that explained a large part of the variation in S_{ij} across countries is not significant in the $\sigma_{ij}^{\Delta p}$ regression. In the linear regression equation reported in Table 9, there is no sign of any non-linearity, and neither $dist_{ij}$ nor ifs_{ij} is statistically significant. The effects of monetary union membership are apparent only when we are looking at the correlation of unconditional price movements.

Table 10 shows that there is no evidence that membership of the same monetary union increases the extent of business cycle correlation, as measured by the correlation of output innovations in each country, $\sigma_{ij}^{\Delta y}$. There is some evidence, at least in the Caribbean, that exogenous characteristics such as the structure of production do affect this correlation. In the Caribbean sample the coefficient on $f(|\ g_i\ -\ g_j\ |)$ is –0.097, which is significantly different from zero. The sample standard deviation of this variable is 1.154, so the estimated coefficient on this variable implies that two countries with an atypically high difference in the structure of production (say, two standard deviations above the mean) can be expected to have an output innovation correlation that is about 22% lower than average. When one conditions the cross-country correlation of output shocks on these structural characteristics, the ifs_{ij} dummy plays no significant role.

6. Summary and Conclusion

In this paper we have explored the factors that determine the degree of macroeconomic integration in two areas of the world: the CFA Franc Zone and the Caribbean, including the East Caribbean Currency Union. All of the countries in our two samples have maintained a pegged exchange rate over the last 40 years (to the French Franc and US Dollar respectively). Some of them share the same currency. Our aim has been to see whether sharing a common currency delivers an extra degree of macroeconomic integration, as compared with sharing a common peg. Four indicators of integration are considered: trade intensity, unconditional real exchange rate volatility, and the correlation of innovations in domestic prices and real output.

The evidence on the effect of a single currency is mixed. In the CFA, sharing a common currency is associated with substantially more bilateral trade, but only among the countries that are landlocked. This suggests that capacity of a single currency to reduce the barriers to trade is entwined with the countries' geographical characteristics, which are important in determining the size of transportation costs. In both the CFA and the Caribbean, sharing a common currency is associated with substantially lower bilateral real exchange rate volatility. In the Caribbean the size of this effect depends on geographical location. For countries further apart, the effect is stronger.

However, the real exchange rate effects of a single currency disappear when one looks at the cross-country correlation of shocks to prices, that is, domestic price changes conditional on foreign (i.e., European or American) price changes, and on changes in domestic output and money. So the greater degree of correlation of prices within a monetary union probably results from a similarity in the pattern of changes in aggregate demand (and in particular, in monetary changes) rather than from greater market integration. Furthermore, there is no evidence that the members of a monetary experience a greater degree of business cycle convergence, when such convergence is measured in terms of the correlation of innovations in GDP.

Macroeconomic integration can be measured in a variety of different ways. For some – but not all – measures, sharing a single currency promotes more integration than can be expected in countries that just share the same currency peg. In order to decide whether the international policy co-ordination necessary for full monetary union is worth the effort, we need to know which kinds of integration are the most relevant in evaluating social welfare. Even then, the size of the single currency effect will not be independent of the geographic and economic characteristics of the countries concerned.

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Table 1: Trade Statistics for CFA Members

Figures are for the most recent year available in IFS DOTS

Country	*Exports to LDCs (% Total Exports)*	*Imports from LDCs (% Total Imports)*
Benin	06	29
Burkina Faso	58	48
Cameroon	28	33
Centrafrique	18	31
Chad	15	44
Congo Republic	72	31
Côte d'Ivoire	45	54
Gabon	22	12
Mali	45	64
Niger	47	52
Senegal	49	44
Togo	80	69

Table 2: Monetary Groupings in the CFA and the Caribbean

Countries in italics are excluded from the econometric analysis because of inadequate data (i.e., the relevant economic time-series in World Bank World Development Indicators are incomplete).

1. CFA Countries (2 separate currencies)

UEMOA: Benin, Burkina Faso, Cote d'Ivoire, *Guinea-Bissau*, Mali, Niger, Senegal, Togo

UDEAC: Cameroon, C.A.R., Chad, Congo Republic, *Equatorial Guinea*, Gabon

2. Caribbean & Central American Countries (4 separate currencies)

ECCU: Antigua & Barbuda, *Aruba*, Dominica, Grenada, *Montserrat*, St. Kitts & Nevis, St. Lucia, St. Vincent & the Grenadines

Separate: US$ pegs: Barbados, Belize

Dollarized: The Bahamas, Panama

Table 3: Summary Statistics

	ben	bfa	civ	sen	tgo	mli	ner	cam	cgo	gab	car	tcd
1987 agriculture value added (% GDP)	33.3	31.5	29.2	21.7	33.5	45.2	36.3	24.8	11.9	11	46.9	33.1
1997 agriculture value added (% GDP)	38.4	31.8	27.3	18.5	42.2	44.0	38.0	42.1	9.5	7.5	54.1	37.4
1987 total external debt (% GDP)	76.4	38.4	134.6	87.6	98.9	94.2	75.1	33.2	145.2	79.8	47.8	27.9
1997 total external debt (% GDP)	75.9	54.5	152.3	81.0	89.2	119.9	88.7	101.9	227	67.5	92.3	54.9
1987 exports (% GDP)	29.3	10.6	33.4	24.1	41.4	16.6	21.5	15.7	41.7	42.7	16.2	15.4
1997 exports (% GDP)	24.9	11.2	46.6	32.8	34.7	25.5	16.2	26.8	77.0	64.0	19.5	18.7
1985 gross investment (% GDP)	12.9	20.9	12.3	12.5	17.6	20.7	12.0	24.7	19.7	26.4	12.5	9.1
1995 gross investment (% GDP)	18.5	27.0	16.0	18.7	14.9	20.6	10.8	16.2	26.0	26.3	9.0	16.3
sample s.d. Δy (%)	4.5	4.0	6.3	3.8	7.4	5.3	9.0	5.7	6.9	9.0	4.2	11.4
sample s.d. Δp (%)	8.0	8.1	6.8	7.9	8.0	10.0	9.1	7.2	7.8	9.0	6.5	8.0
sample s.d. Δm (%)	30.0	9.9	10.5	16.0	34.3	11.1	13.6	13.1	13.7	16.8	13.7	16.8

	atg	dma	grd	ktn	lca	vct	bhs	brb	blz	pan
1985 agriculture value added (% GDP)	5.0	28.0	17.1	9.1	15.2	19.6	2.2	6.2	20.4	8.8
1995 agriculture value added (% GDP)	3.8	20.4	10.1	5.3	10.5	14.1	——	——	20.7	8.4
1985 exports (% GDP)	88.6	36.5	43.0	55.4	55.9	73.0	64.8	67.8	48.5	68.6
1995 exports (% GDP)	85.9	46.8	45.4	49.6	67.6	53.1	——	——	49.8	100.7
1985 gross investment (% GDP)	——	28.5	26.6	30.3	21.0	28.0	19.2	15.4	21.6	15.2
1995 gross investment (% GDP)	46.7	32.6	32.1	46.0	19.0	33.2	——	——	20.0	30.3
1985 total external debt (% GDP)	——	55.1	40.7	16.4	10.6	22.0	——	38.1	56.6	88.1
1995 total external debt (% GDP)	——	44.6	40.8	24.2	22.6	78.4	——	34.3	44.0	79.4
sample s.d. Δy (%)	3.56	6.07	5.57	3.61	7.2	5.22	6.84	3.76	1.0	4.46
sample s.d. Δp (%)	3.42	4.57	4.13	4.46	4.81	3.33	2.17	4.32	0.97	4.09

Source: World Bank *World Development Indicators 1999*. Δy: GDP growth rate; Δp: inflation; Δm: money supply growth rate

Table 4: Common Currency Effects on Trade Intensity in the CFA

The dependent variable is ln(1+T); the regression also includes country fixed effects.

variable	*coeff.*	*h.c.s.e.*	*t ratio*	*ptl.* R^2	*coeff.*	*h.c.s.e.*	*t ratio*	*ptl.* R^2
$y_i \cdot y_j$	−0.42693	0.28202	−1.51	0.0423	−0.45123	0.27857	−1.62	0.0900
$y^p{}_i \cdot y^p{}_j$	+0.60948	0.44724	+1.36	0.0261	+0.74544	0.35529	+2.10	0.0900
$a_i \cdot a_j$	−0.17426	0.15384	−1.13	0.0259				
ifb_{ij}	+1.52930	0.45887	+3.33	0.2178	+1.45650	0.49910	+2.92	0.3100
ifc_{ij}	+0.09240	0.58497	+0.16	0.0005				
dst_{ij}	−0.67841	0.78537	−0.86	0.0179	−0.72519	0.41628	−1.74	0.1000
ifs_{ij}	−0.61079	0.83264	−0.73	0.0104				
$ifs \cdot dst_{ij}$	−0.23643	0.58419	−0.40	0.0035				
$ifs \cup ifc_{ij}$	+1.08890	0.46108	+2.36	0.1050	+0.92816	0.33192	+2.80	0.2000
R^2	+0.90193				+0.89768			
NORM	+1.99250				+2.50240			
SC	+0.56959				+0.35810			
HQ	+0.14819				+0.01697			
AIC	−0.12712				−0.20590			

Table 5: RESET Tests for Functional Form Specification (All Equations)

CFA	***Equation***	***Unrestricted Model***	***Restricted Model***
	ln(1+T)	F(3,53) = 0.88303 [0.4559]	F(3,58) = 0.37202 [0.7735]
	S	F(3,56) = 0.05133 [0.9845]	*no conditioning variables*
	$\sigma^{\Delta p}$	F(3,56) = 0.39742 [0.7554]	F(3,61) = 0.02746 [0.9938]
	$\sigma^{\Delta y}$	F(3,56) = 0.40897 [0.7472]	*no conditioning variables*
ECCU	***Equation***	***Unrestricted Model***	***Restricted Model***
	S	F(3,37) = 0.32188 [0.8095]	F(3,39) = 0.13441 [0.9390]
	$\sigma^{\Delta p}$	F(3,38) = 0.72641 [0.5426]	*no conditioning variables*
	$\sigma^{\Delta y}$	F(3,38) = 0.86249 [0.4689]	F(3,40) = 0.65188 [0.5865]

Table 6: Common Currency Effects on Unconditional Real Exchange Rate Volatility

The dependent variable is S; the regression also includes country fixed effects.

a) CFA

variable	*coeff.*	*h.c.s.e.*	*t ratio*	*ptl.* R^2	*coeff.*	*h.c.s.e.*	*t ratio*	*ptl.* R^2
$f(g_i-g_j)$	-0.03056	0.04360	-0.70	0.0087				
$f(d_i-d_j)$	-0.00368	0.01830	-0.20	0.0004				
$f(ctot_{ij})$	-0.07051	0.07909	-0.89	0.0150				
ifb_{ij}	-0.09241	0.17186	-0.54	0.0052				
ifc_{ij}	+0.08370	0.18530	+0.45	0.0037				
dst_{ij}	-0.22236	0.18746	-1.19	0.0216				
ifs_{ij}	-0.29545	0.15422	-1.92	0.0629	-0.19710	0.09377	-2.100	0.0832
R^2	+0.57533				+0.54916			
σ	+0.36208				+0.35132			
SC	-1.16519				-1.48627			
HQ	-1.54646				-1.74714			
AIC	-1.79554				-1.48627			

b) ECCU

variable	*coeff.*	*h.c.s.e.*	*t ratio*	*ptl.* R^2	*coeff.*	*h.c.s.e.*	*t ratio*	*ptl.* R^2
$f(g_i-g_j)$	-0.03379	0.03593	-0.94	0.0265				
$f(d_i-d_j)$	-0.00654	0.02344	-0.28	0.0015				
dst_{ij}	+0.74303	0.09503	+7.82	0.7094	+0.73502	0.09911	+7.42	0.7008
ifs_{ij}	-1.50370	0.49233	-3.05	0.2780	-1.57190	0.43479	-3.62	0.2965
$ifs \cdot dst_{ij}$	-0.53765	0.19065	-2.82	0.3126	-0.55655	0.17279	-3.22	0.3252
R^2	+0.87922				+0.87553			
σ	+0.25446				+0.25012			
SC	-1.87379				-2.01286			
HQ	-2.25150				-2.34022			
AIC	-2.47601				-2.53479			

Table 7: Structural Innovation Correlations

(For Δy above the diagonal and Δp below. *** significantly different from zero at 1%; ** at 5%; * at 10%)

	ben	bfa	sen	tgo	ner	cam	gab	car	tcd	civ	mli	cgo
Ben		0.47***	0.13	0.56***	0.38**	0.52***	0.48***	0.31*	0.28	−0.58***	−0.48***	−0.50***
Bfa	0.74***		0.68***	0.78***	0.76***	0.69***	0.84***	0.54***	0.67***	−0.73***	−0.77***	−0.83***
Sen	0.72***	0.89***		0.58***	0.79***	0.56***	0.63***	0.40***	0.55***	−0.56***	−0.64***	−0.68***
Tgo	0.82***	0.84***	0.91***		0.85***	0.81***	0.90***	0.67***	0.77***	−0.87***	−0.93***	−0.93***
Ner	0.41**	0.47***	0.41**	0.50***		0.76***	0.82***	0.58***	0.65***	−0.80***	−0.83***	−0.90***
Cam	0.75***	0.81***	0.94***	0.89***	0.27		0.87***	0.62***	0.69***	−0.74***	−0.76***	−0.83***
Gab	0.75***	0.87***	0.95***	0.90***	0.39**	0.96***		0.69***	0.75***	−0.82***	−0.88***	−0.93***
Car	0.77***	0.84***	0.97***	0.93***	0.39**	0.95***	0.97***		0.61***	−0.42***	−0.57***	−0.66***
Tcd	0.67***	0.56***	0.56***	0.59***	0.25	0.63***	0.61***	0.60***		−0.61***	−0.79***	−0.80***
Civ	0.82***	0.89***	0.90***	0.90***	0.46***	0.91***	0.92***	0.91***	0.64***		0.86***	0.87***
Mli	0.74***	0.81***	0.92***	0.91***	0.47***	0.89***	0.94***	0.94***	0.66***	0.86***		0.94***
Cgo	0.74***	0.86***	0.94***	0.90***	0.44***	0.91***	0.92***	0.95***	0.69***	0.89***	0.91***	

	atg	dma	grd	ktn	lca	vct	bhs	brb	blz	pan
Atg		0.292	0.375**	0.631***	0.107	0.188	0.086	0.150	0.062	-0.011
Dma	0.681***		0.006	0.234	0.200	0.309*	0.133	-0.034	0.320*	-0.249
Grd	0.248	0.586***		0.229	-0.156	0.328*	0.316*	0.364*	0.055	0.108
Ktn	0.454**	0.321*	0.256		0.332*	-0.036	0.122	0.162	0.248	-0.148
Lca	0.026	0.072	-0.204	0.087		0.220	0.139	0.407**	0.289	-0.291
Vct	0.062	-0.145	0.023	0.235	-0.209		0.132	0.008	0.326**	-0.310*
Bhs	0.202	-0.061	-0.233	0.124	-0.107	0.132		0.283*	0.040	0.117
Brb	0.672***	0.520***	0.503***	0.313**	-0.265	-0.191	0.142		0.006	-0.025
Blz	0.386**	0.483***	0.487***	0.219	-0.190	-0.114	-0.177	0.579***		-0.193
Pan	0.084	0.124	0.239	0.147	-0.176	-0.169	-0.056	0.367*	0.244	

Table 8: Identification of "Core Groups"

The table shows the mean value of cross-country correlations in either price innovations (ε_1) or output innovations (ε_2) for different "core groups" of countries. Corresponding standard deviations (S.D.) are also shown, along with the percentage of correlations significantly greater than zero (% Sig.).

	Core Group	Mean Corr.	S.D. Corr.	% Sig.
CFA				
Prices Group #1	ben, bfa, civ, sen, tgo, mli, ner, cam, cgo, gab, car, tcd	0.759	0.194	96
Prices Group #2	civ, sen, tgo, mli, cam, cgo, gab, car	0.921	0.026	100
Output Group #1	ben, bfa, sen, tgo, ner, cam, gab, car, tcd	0.629	0.175	100
Output Group #2	civ, mli, cgo	0.890	0.036	100
Caribbean				
Prices Group #1	atg, dma, grd, ktn, brb, blz, pan	0.377	0.174	57
Prices Group #2	atg, dma, grd, brb, blz	0.515	0.123	90
Output Group #1	atg, dma, grd, ktn, lca, vct, bhs, brb, blz	0.191	0.155	31

Table 9: Common Currency Effects on Price Innovation Correlations

The dependent variable is $\ln\left(\frac{1+\sigma_{ij}^{\Delta p}}{1-\sigma_{ij}^{\Delta p}}\right)$*; the regression also includes country fixed effect*

a) CFA

variable	*coeff.*	*h.c.s.e.*	*t ratio*	*ptl.* R^2	*coeff.*	*h.c.s.e.*	*t ratio*	*ptl.* R^2
$f(g_i-g_j)$	-0.00596	0.05910	-0.10	0.0003				
$f(d_i-d_j)$	-0.01703	0.02474	-0.69	0.0076				
$f(ctot_{ij})$	-0.11163	0.08364	-1.33	0.0355				
ifb_{ij}	+0.17574	0.20188	+0.87	0.0180	+0.27305	0.15682	+1.74	0.0705
ifc_{ij}	-0.13388	0.24138	-0.55	0.0090				
dst_{ij}	-0.16997	0.19911	-0.85	0.0123				
ifs_{ij}	-0.12549	0.18117	-0.69	0.0115	-0.05316	0.14343	-0.37	0.0037
R^2	+0.89721				+0.89072			
σ	+0.36864				+0.36136			
SC	-1.12928				-1.38546			
HQ	-1.51055				-1.66639			
AIC	-1.75964				-1.84993			

b) ECCU

variable	*coeff.*	*h.c.s.e.*	*t ratio*	*ptl.* R^2	*coeff.*	*h.c.s.e.*	*t ratio*	*ptl.* R^2
$f(g_i-g_j)$	-0.00684	0.05433	-0.13	0.0006				
$f(d_i-d_j)$	+0.02759	0.04118	+0.67	0.0071				
dst_{ij}	+0.09438	0.10574	+0.89	0.0218				
ifs_{ij}	+0.30846	0.26619	+1.16	0.0340	+0.19007	0.23673	+0.80	0.0171
R^2	+0.68113				+0.66940			
σ	+0.40176				+0.39062			
SC	-1.01216				-1.22983			
HQ	-1.36470				-1.50682			
AIC	-1.57424				-1.67146			

Table 10: Common Currency Effects on Output Innovation Correlations

The dependent variable is $\ln\left(\frac{1+\sigma_{ij}^{\Delta y}}{1-\sigma_{ij}^{\Delta y}}\right)$*; the regression also includes country fixed effects.*

a) CFA

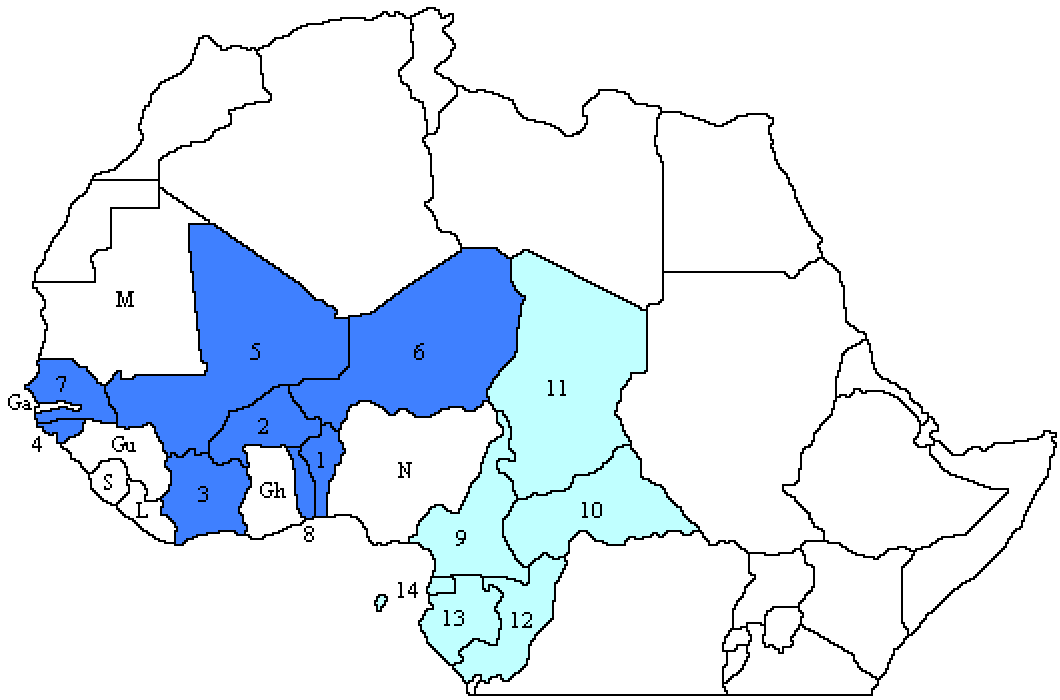
variable	*coeff.*	*h.c.s.e.*	*t ratio*	*ptl.* R^2	*coeff.*	*h.c.s.e.*	*t ratio*	*ptl.* R^2
$f(g_i-g_j)$	+0.05930	0.17428	+0.34	0.0013				
$f(d_i-d_j)$	+0.08774	0.09983	+0.88	0.0081				
$f(ctot_{ij})$	-0.28137	0.33064	-0.85	0.0093				
ifb_{ij}	+0.30777	0.82729	+0.37	0.0022				
ifc_{ij}	-1.04880	0.91432	-1.15	0.0219				
dst_{ij}	-0.38725	0.60127	-0.64	0.0026				
ifs_{ij}	-0.79082	0.59729	-1.32	0.0183	-0.29943	0.42382	-0.71	0.0081
R^2	+0.37315				+0.34049			
σ	+1.84044				+1.77771			
SC	+2.08661				+1.75652			
HQ	+1.70534				+1.49565			
AIC	**+1.45626**				**+1.32522**			

b) ECCU

variable	*coeff.*	*h.c.s.e.*	*t ratio*	*ptl.* R^2	*coeff.*	*h.c.s.e.*	*t ratio*	*ptl.* R^2
$f(g_i-g_j)$	-0.09673	0.04159	-2.33	0.1040	-0.10970	0.04772	-2.30	0.1331
$f(d_i-d_j)$	-0.02171	0.06219	-0.35	0.0081				
dst_{ij}	-0.09037	0.09796	-0.92	0.0261				
ifs_{ij}	+0.00267	0.22070	+0.01	0.0000	+0.13202	0.21390	+0.62	0.0109
R^2	+0.51306				+0.49613			
σ	+0.35047				+0.34554			
SC	-1.28537				-1.42037			
HQ	-1.63791				-1.72254			
AIC	-1.84744				-1.90214			

Figure 1: The CFA Franc Zone

The dark shaded area is the UEMOA; the light shaded area is the UDEAC.



1 = Benin; 2 = Burkina Faso; 3 = Côte d'Ivoire; 4 = Guinea-Bissau; 5 = Mali; 6 = Niger; 7 = Senegal; 8 = Togo
9 = Cameroon; 10 = C.A.R.; 11 = Chad; 12 = Congo Republic; 13 = Gabon; 14 = Equatorial Guinea
Ga = Gambia; Gh = Ghana; Gu = Guinea-Conakry; L = Liberia; M = Mauritania; N = Nigeria; S = Sierra Leone