Center for European, Governance and Economic Development Research
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Discussion Papers

Number 311 – May 2017

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GEORG-AUGUST-UNIVERSITÄT GÖTTINGEN

ISSN: 1439-2305

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Abstract

This paper estimates a gravity model of trade to evaluate the trade effects of the Euro on sectoral trade within the Euro Zone, the CFA Franc Zone and between the Eurozone and the CFA Franc Zone, when CFA countries acquired fixed rates against the non-francophone Eurozone members. The formation of the Eurozone provides a quasi-natural experiment to estimate the effects on trade of fixed exchange rates, since the change in exchange rate regime for CFA countries with all Eurozone countries but France was not trade related. This is tested using sectoral trade data for 128 countries over the period 1995-2009 and validated using a larger sample of 180 countries over the period 1973 -2013. The main departure from Frankel (2008), is the use of sectoral trade and the inclusion of bilateral-sectoral fixed effects as well as controls for multilateral resistance, namely time varying country-fixed-effects for exporters and importers, in the gravity model specification. The main results indicate that the introduction of the Euro is generally not associated with positive effects for average trade flows between the CFA Franc Zone and other Eurozone countries. However, the results differ by sector and we find that agricultural (homogeneous products) exports from CFA countries to Euro adopters increased by almost fifty (thirty) percent after the euro adoption.

JEL: F10, F14

Key Words: CFA, Euro Effect, Bilateral Trade, panel data

ACKNOWLEDGEMENT
Financial support from the Spanish Ministry of Economy and Competitiveness is grateful acknowledged (ECO2014-58991-C3-2-R).

The Euro and the CFA Franc: Evidence of Sectoral Trade Effects

1. Introduction

The controversial debate about the "Euro effect" following Rose (2000) identified several methodological problems that were disregarded in earlier empirical studies estimating the trade effects of currency unions. Later studies have found much lower effects –though still robust– but could not overcome concerns of an endogeneity bias. A number of authors, among them Baldwin (2006), Carrere (2004) and Frankel (2008), argue that in the case of the Euro and most other currency arrangements, it is hard to isolate the effect of fixed exchange rates on trade due to the endogeneity of the currency decision. Countries tend to cooperate more with geographically-close countries, with whom they also have strong cultural and historical ties, and in particular, monetary cooperation is usually accompanied with other trade-promoting integration attempts (Tapsoba, 2009; Diallo and Tapsoba, 2016).

In this context, the case of the African Financial Community[1] (CFA), first examined by Carrere (2004) and Frankel (2008), deserves a second examination. The CFA franc is the name of two currencies, specifically the West African CFA franc, which is the official currency of the Economic and Monetary Union of West Africa (WAEMU), and the Central African CFA franc, which is the official currency of the Economic and Monetary Community of Central Africa (CEMAC). Despite being -theoretically- two currencies, they could be exchanged one-to-one through the Euro. These two currencies were pegged to the French Franc and guaranteed by the French treasury until France adopted the Euro. As a by-product of the introduction of the Euro in 1999, the currencies of both monetary unions, WAEMU and CEMAC, have since been pegged to the Euro. This provides an interesting natural experiment, since WAEMU and CEMAC members had no intention of pegging their currency to the currencies of other Eurozone (EZ) members –excluding France– and this event is not linked to deeper integration between both African unions and Eurozone members. For these reasons, the link to the Euro with the CFA Franc could be considered to be exogenously determined.

[1] CFA is the acronym for Communauté Financière Africaine (African Financial Community) - See more at: http://africanbusinessmagazine.com/uncategorised/a-brief-history-of-the-cfa-franc/#sthash.OcjOKe7i.dpuf.

This allows us to isolate the trade effect of this currency arrangement for countries involved in other trade promoting attempts and to quantify the effect without incurring an endogeneity bias affecting the currency decision. Carrere (2004) successfully separated the trade promoting effect of free trade agreements (FTA) from the effect of completely eliminating exchange rate volatility for the countries in CEMAC and WAEMU. She found that the introduction of the exchange rate volatility variable reduced the FTA effect by around 50 percent for countries in FTAS with a common currency.

In the context of the Euro Effect literature, Frankel (2008, 2010) investigates the impact of the fixed exchange rate effect between the Eurozone and the CFA Franc Zone using a gravity model of trade to consider the exogeneity of the currency decision. He uses trade data for the years 1948-2006 and finds that bilateral trade between members of the Eurozone and the CFA Franc Zone is 76 percent higher after the introduction of the Euro, whereas trade within the CFA Franc Zone, decreased by 52 percent after the event –although the estimate is very imprecise and only significant at the 10 percent level–. We claim that the models used to obtain positive effects for trade between the Eurozone and the CFA Franc Zone in Frankel (2008, 2010) omit multilateral resistance terms leading to biased results.

The pegging of fixed exchange rates has important advantages for the countries that opt for this monetary strategy. In particular, a pegged or fixed exchange rate makes trade less risky and the revenues of trading firms less uncertain and can reduce the likelihood of a currency crisis. On the other hand, this policy could generate problems with reserves and an inability to respond to external shocks (Carrere, 2004).

The main aim of this study is to quantify the effect of adopting the Euro on bilateral trade flows involving countries with a pegged exchange rate to the French franc. Similar to Frankel (2008), we claim that adoption of the Euro is strictly exogenous, with the African countries not having any economic or political motivation nor any influence in the decision of France to adopt the Euro. Departing from Frankel (2008), the modelling strategy consists of estimating a theoretically founded gravity model for import and export flows –unidirectional trade flows– within the CFA Franc Zone and between the Eurozone and the CFA Franc Zone. We first use disaggregated trade data for 128 countries over the years 1995-2009 and as robustness we use an extended sample for 180 countries for aggregated trade and for selected sectors over a longer

period (from 1973 to 2013). More specifically, we depart from the approach in Frankel (2008) in two respects. First, we use panel data estimation methods, introducing multilateral resistance factors that are time variant, namely, time-varying country dummies for exporters and importers and dyadic-sectoral fixed effects in our first sample (dyadic fixed effects in the second one). Second, we distinguish between the trade of different types of goods, agricultural, minerals and manufactured goods (homogeneous and differentiated goods) and can estimate sector-specific effects.

The main results indicate that the introduction of the Euro is generally not associated with positive effects for average trade flows between the CFA Franc Zone and other Eurozone countries. However, the results differ by sector and we find that agricultural (homogeneous products) exports from CFA countries to Euro adopters increased by almost fifty (thirty) percent after the euro adoption.

The results also indicate that the introduction of the Euro is associated with positive trade effects for intra-EZ exports of agricultural goods, mine and minerals and mostly differentiated goods. It is also associated with positive increases in trade within the CFA zone for trade in manufactured goods.

The rest of the paper is structured as follows: Section 2 describes the CFA Franc Zone and Section 3 revises the related literature. Section 4 presents the data, variables and model specification and the main empirical results and robustness checks are presented in Section 5. Finally, Section 6 concludes.

2. The CFA Zones

The two CFA Franc Zones –the WAEMU[2] and the CEMAC[3]– were created in 1945 by linking two currency unions with a pegged exchange rate between their currencies and the French Franc. As both currency unions have had the same fixed exchange rate with respect to the French Franc and later to the Euro[4], the exchange rate between both CFA Franc zones equals one[5].

[2] In 2012 consisting of Benin, Burkina Faso, Ivory Coast, Guinea-Bissau, Mali, Niger, Senegal and Togo.

[3] In 2012 consisting of Cameroon, Central African Republic, Chad, Republic of Congo, Equatorial Guinea and Gabon.

[4] Since the last devaluation of the CFA Franc in 1994, the fixed exchange rates are FF 1 = CFA 100 and Euro 1 = CFA 655.957.

All member states of the CFA Franc zones are Sub-Saharan African countries and all but Guinea-Bissau and Equatorial Guinea were French colonies before gaining independence. A unique feature of both currency unions was the involvement of France as the anchor currency country in the monetary policy of the central banks of the WAEMU and CEMAC. France guaranteed the convertibility into their own currency and participated in the executive boards of the central banks with veto power and thus the ability to block any decisions until the adoption of the Euro. In fact, the CFA Franc Zones went beyond the features of a regular currency union. With the devaluation imposed by France in 1994[6], very similar rules of macroeconomic surveillance to those established in the EMU were introduced and gradually implemented. The three main convergence criteria are an inflation rate below 3 percent, a debt-to-GDP ratio below 70 percent and a balanced budget (Hallet 2008).

The fixed peg of the CFA Franc to the French Franc/Euro serves as an important anchor for monetary policy for the CFA members. As a disadvantage, it implies the lack of monetary and exchange rate policies as an option to support a smooth adjustment to regional or country-specific shocks. According to Hallet (2008) and Tapsoba (2009), the common currency has significantly contributed to achieving higher macroeconomic stability in the area than in other Sub-Saharan African countries. The convertibility to the French Franc/Euro facilitates external transactions and provides the CFA Franc zones with credibility and stability. This is broadly seen as enhancing the conditions for trade in general and not only for trade within the currency union. In this sense, it could be expected that trade diversion with the rest of the world attributed to the currency unions will be less likely to happen since convertibility is guaranteed by France or by the European Central Bank after the Euro (Carrere, 2004).

Nevertheless, while monetary integration is well established, economic integration is still incomplete in the WAEMU and CEMAC areas. A weak economic environment and a high dependence on commodity exports increases the likelihood of asymmetric shocks and of pro-cyclical fiscal behaviour. This is the main reason

[5] However, the central banks of the two CFA monetary unions decided in 1993 that notes presented outside the unions could not be exchanged (Carrere, 2004).

[6] The CFA Franc lost 100% of its value. One French Franc was worth 50 CFA Francs before the devaluation and 100 after. It was an important shock for the CFA economies, which led to a high increase in the price of imported goods and deteriorated the living standards of the population in the short run.

why overall compliance with the aforementioned convergence criteria has often been insufficient in most of the member countries.

3. Literature Review

The analysis and quantification of the trade effects derived from the CFA Franc as a common currency, with two currency unions involved and linked to the Euro with a fixed peg, is not an easy task. While trade effects of a currency union may occur within the two different CFA Franc zones, there may also be trade effects derived from a fixed peg between them, the WAEMU and CEMAC, and between the Eurozone and the CFA Franc zones.

There is extensive literature investigating both effects, which are very much related, since forming a currency union and linking two currencies with a fixed peg both imply the elimination of any volatility in the nominal bilateral exchange rate[7].

The empirical literature investigating the trade effects of exchange rate volatility generally finds mixed results. Most studies show insignificant or weak, but significant negative effects[8].In sharp contrast to these results, studies investigating trade effects of currency unions usually find robust positive effects. While some studies found extremely positive results of up to a 200 percent increase in trade (Rose, 2000; Glick and Rose, 2002; Frankel, 2010), other studies find smaller magnitudes –a positive effect between 5-30 percent– still robust and statistically significant (Flam and Nordström, 2003; Micco el al, 2003; Baldwin et al, 2008; Glick and Rose, 2016). Most of the recent studies have focused on trade effects of the Eurozone and not in currency unions in general[9] and have been restricted to examining the trade effects not only of currency unions, but also of exchange rate volatility in industrialized countries. In contrast, studies for

[7] Given the one to one convertibility between both CFA Francs and the fact that France is the anchor currency with significant influence on the central bank policy for both currencies, one might also consider the two monetary unions of the CFA Franc Zone as one large currency union. In the core of this study, we do not distinguish between both currency unions and treat the CFA Franc as a single currency union. We add as robustness check an estimation of separated effects for both areas.

[8] See survey papers on the relationship between exchange rate volatility and trade from McKenzie (1999), Ozturk (2006), Bahmani-Oskooee & Hegerty (2007) and Auboin & Ruta (2011).

[9] An excellent overview of the literature can be found in Baldwin (2006).

developing and especially Sub-Saharan African countries are scarce. An exception is Fielding & Shields (2005), who investigate the impact of the CFA Franc on macroeconomic integration in the form of trade intensity and business cycle synchronisation for the years 1981-2000. They find evidence of positive effects for intra- and inter-CFA zone trade that are declining over time. The results for the early years are of a similar magnitude as those found by Rose (2000) using a global sample. Fielding & Shields (2005) state that the smaller magnitude of the effects obtained for more recent years, especially for the fixed exchange rate effect of inter-CFA zone trade, can be explained by the high correlation existing between exchange rate stability and other forms of macroeconomic policy stability. Reforms in this field in countries with flexible exchange rates reduce potential gains stemming from exchange rate stability.

Carrere (2004) analysed the effect of regional trade agreements and currency unions on trade in Sub-Saharan Africa for the period from 1962 to 1996 using a gravity model. The model is estimated using a Hausman-Taylor estimator with bilateral fixed effects to control for the endogeneity of the target variables. In particular, she found that the currency unions in the two agreements of the CFA franc zones –the WAEMU and CEMAC– have increased intra-regional trade beyond the increase generated by the corresponding free trade agreements and have in turn mitigated trade diversion with the rest of the world. The main explanation for a lower trade diversion is that convertibility, guaranteed by the French (or the European central bank after the Euro), makes transactions with the rest of the world easier and safer for the CFA franc zones' members than for other comparable African countries.

Tapsoba (2009) investigates whether the effect of the two African monetary Unions on trade more than compensates for the negative impact of asymmetric shocks among African countries, which the author named 'the endogeneity effect'. The author finds that intra-African trade increases the co-movement of African business cycles, but the magnitude of the effect is smaller than similar estimates among developed countries. Dialo and Tapsoba (2016) specifically focus on the changes in business cycle patterns in Sub-Saharan Africa and the rising influence of trade links with BRIC countries. They find that synchronization with these countries has increased in the last decade, mainly due to increasing trade and integration,

whereas it has decreased with G7 countries. Moreover, they state that not only regional integration, but also currency unions amplify the impact of trade on business cycle synchronization.

Masson (2008) evaluates whether currency unions in Sub-Saharan Africa are justified by positive trade effects. He argues that due to asymmetries across countries and the low level of trade amongst members, a selective expansion of existing fixed exchange rate agreements, such as the CFA Franc Zone or the adoption of a foreign currency, such as the Euro in the form of a dollarization, would be preferable than the formation of new currency unions in the area. In addition, he finds that other trade facilitation targets, such as improving infrastructure, political stability and efficient merchandise handling, are more effective in increasing trade than solely focusing on the formation of a currency union.

Tsangarides et al. (2006) investigate the trade effects of currency unions using an augmented version of the gravity model of trade for the case of Africa with data for 217 countries over the period 1948-2002. They find that a pair of countries that are members of the same currency union trade 100 percent more than others and that the size of the effect is very similar for African countries and the whole sample. They also find that the trade effect is not associated with trade diversion from non-currency-union members and is stronger the longer the mutual currency union membership persists.

The relative importance of the exchange rate in comparison to other variables in explaining the "border effect puzzle" is evaluated in De Sousa & Lochard (2005). The authors estimate a gravity model of trade and find that between 17 and 28 percent of the total border effect for the CFA Franc Zone is caused by currency related effects such as currency handling and exchange rate uncertainty.

The evaluation of the effect of fixed exchange rate regimes on trade, which imply the elimination of any volatility in the nominal bilateral exchange rate, is addressed by Frankel (2008) in the context of the CFA and the Euro, as already described in the introduction, and more recently by Baranga (2014) in a more general context. Baranga (2014) estimates the causal impact of a change in the exchange regime on aggregate trade and finds that estimates from a traditional gravity equation framework are biased up by the tendency of countries that stabilize their currencies to do so mainly with respect to major trading partners.

Finally, in a descriptive study, Hallet (2008) reports a declining share of trade for the CFA Franc Zone with the Eurozone in the past decades. He attributes this to the longer-term adjustment from colonial economic ties and the increasing importance of emerging economies in Asia in more recent years. They conclude that in addition to political instability, infrastructure and merchandise handling, currency related problems appear to be an important constraint for trade in Sub-Saharan Africa.

To sumarize, empirical results generally indicate positive effects of trade between the CFA zone and the Eurozone and no signs of trade diversion even in more recent periods, despite the decreasing relative importance of the Eurozone in trade for the CFA Franc Zone found in Hallet (2008). Meanwhile, results on the trade effects within the CFA Franc Zone are generally mixed, indicating that the CFA Franc Zone has not substantially contributed to regional trade integration.

Most of the above-mentioned studies restrict their investigation to aggregate trade effects and do not distinguish between different types of products[10].

4. Data, Variables and Empirical Strategy

4.1 Data and Variables

The main dataset of this study covers 128 countries (See Table A.1 in the Appendix) for the years 1995-2009 and 69 categories of goods. Data on bilateral trade flows are reported at the 2-digit level of the Standard International Trade Classification (SITC) Rev. 2 from UN-Comtrade. Products are classified into four different groups: agricultural goods (1), mining (2), manufactured homogenous and referenced priced goods (3) and manufactured differentiated goods (4). The goods have been classified according to the conversion table proposed in Rauch (1999) as shown in Table A.2 in the appendix. The relative size of the trade volume of the four groups of goods is shown in the first part of Table 1 for different directions of flows. It underlines the importance of agricultural goods and mining for exports from CFA members and the exports of manufactures for the Eurozone. The second and third parts of Table 1 show the average exports by country group before and after the Eurozone was created, respectively. Average exports within

[10] Baldwin et al (2005) and Flam and Nordström (2006) estimate sectoral effects for the adoption of the Euro.

the CFA zone are significantly higher after 1999, especially in agricultural products and homogeneous and referenced price manufactures. The same is the case for some trade flows between CFA and France, whereas in general, trade between Eurozone countries and CFA countries is not significantly higher after the euro adoption.

Data on distance and common gravity variables are from CEPII[11] and data on regional trade agreements (RTAs) and currency unions (CUs) are from De Sousa (2012). Information on CFA Franc zone membership was taken from the Banque Centrale des États d'Afrique Centrale (BEAC) and the Banque Centrale des États de l'Afrique de l'Ouest (BCEAO) and Eurozone membership is from Eurostat. All variables in the model are described in Table A.2 in the Appendix.

Table 1: Share of Goods Categories on Total Trade Flows and average exports

Code	Description	Intra-CFA	CFA to France	France to CFA	CFA to EZ	EZ to CFA
Shares on total trade		%	%	%	%	%
1	Agricultural Goods	30.37	39.6	18.23	54.92	21.95
2	Mining	29.37	33.59	3.95	35.68	12.36
3	Homogeneous&Referenced Price	9.37	5.28	6.44	0.95	9.81
4	Differentiated	30.89	21.53	71.37	8.44	55.88
	total	100	100	100	100	100
Average ln exports until 1998						
	All goods	12.747	15.394	15.707	13.193	13.412
1	Agricultural Goods	12.953	16.208	17.354	14.311	14.039
2	Mining	12.735	15.271	15.313	13.430	12.772
3	Homogeneous&Referenced Price	12.932	15.606	18.799	12.269	14.024
4	Differentiated	10.959	11.965	11.267	10.716	11.550
Average ln exports after 1998						
	All goods	13.010*	15.41	16.47*	13.191	13.52
1	Agricultural Goods	13.713*	16.525	17.395	14.471	13.920
2	Mining	12.960	15.302	15.098	13.166	12.796
3	Homogeneous&Referenced Price	13.470*	16.137*	18.769	12.600	14.310
4	Differentiated	9.887	11.651	14.412*	11.005	11.924

Note: * 0.05 denote significance level of a test of difference in means before and after 1999.

[11] See Mayer & Zignago (2011) for a more detailed description.

3.2 Empirical strategy

We estimate an augmented version of the gravity model of trade, which explains bilateral trade between countries as a function of their respective economic masses, the distance between them and a variety of other factors using panel data techniques (Head and Mayer, 2014; Baltagi et al, 2014).

To control for unobserved heterogeneity, we introduce several control variables including country and time fixed-effects. Allowing for time variation in country fixed-effects is more consistent with the theoretical concept of "multilateral resistance" proposed by Anderson & van Wincoop (2003), as multilateral resistance factors are likely to vary over time. Furthermore, time varying dummies for each SITC goods category to control for industry specific differences are included. For comparative purposes, the traditional gravity model is estimated with bilateral time invariant factors, multilateral resistance terms and the usual gravity controls.

The baseline estimated model is given by,

$$\ln Exports_{ijkt} = \beta_0 +$$

$$\beta_1 \ln GDP_{ijt} + \beta_2 \text{CFAEZ}_{\text{ijt}} + \beta_3 \text{EZCFA}_{\text{ijt}} + \beta_4 intraCFA_{ijt} +$$

$$+\beta 5\text{CFAFranceijt} + \beta 6\text{FranceCFAijt} + \beta 7 lnDistanceij + \beta 8 Borderij + \beta 9 ComLanguageij + \beta 10 Landlockij + \beta 11 Colonyij + \beta$$

$$12 RTAijt + \beta 13 CUijt + \beta 15 EUROijt + \delta kt + \pi it + \tau jt + \varepsilon ijkt \qquad (1)$$

where $\varepsilon_{ijtk} = \mu_{ijk} + v_{ijkt}$

$\text{Exports}_{\text{ijkt}}$ denotes bilateral exports of sector k from country i to j at time t, GDP_{ijt} is the cross-product of both countries average nominal GDP and $\text{Distance}_{\text{ij}}$ is the distance between both countries' capitals. We include dummy variables to identify trade flows from the CFA Franc Zone to the Eurozone ($\text{CFA-EZ}_{\text{ijt}}$)[12], the Eurozone to the CFA Franc Zone ($\text{EZ-CFA}_{\text{ijt}}$), between CFA Franc Zone members ($\text{Intra-CFA}_{\text{ijt}}$), from the CFA Franc Zone to France ($\text{CFA-France}_{\text{ijt}}$) and from France to the CFA Franc Zone ($\text{France-CFA}_{\text{ijt}}$)[13]. $\text{Border}_{\text{ij}}$ is a dummy variable that equals one if both countries share a border, zero otherwise, $\text{Language}_{\text{ij}}$ equals one if a

[12] EZ excludes France.

[13] Dummy variables identifying trade flows between the Eurozone and the CFA Franc Zone take the value zero if the exporting or importing country is France as these flows are identified by additional variables. As suggested by an anonymous referee, we have separated the Euro effect from the common currency effect in the model specification by including a Euro dummy and excluding the Eurozone from the common currency dummy. Moreover, the intraCFA and the FranceCFA dummies only take the value of 1 after 1999 to compare trade within these groups before and after adoption of the Euro.

language is spoken by at least nine percent of the population in both countries, $Landlocked_{ij}$ equals one if country i or j are landlocked, two if both countries are landlocked and zero otherwise. $Colony_{ij}$ is a dummy variable that equals one if countries i and j have ever had colonial ties, RTA_{ijt} equals one if both countries have signed a regional trade agreement and CU_{ijt}[14] equals one if both countries are members of the same currency union, zero otherwise (excluding the Eurozone). EUROijt equals one if both countries are members of the Eurozone, zero otherwise. Finally, π_{it} and τ_{jt} are dummy variables that vary by origin and time and destination and time and are used as proxies for multilateral resistance terms.

A second specification incorporates bilateral unobserved heterogeneity modelled using fixed effects/random effects that are specific to each bilateral relationship and sector (*ijk* dimension). In the first case, the within transformation eliminates the variables that are time invariant in specification (1) and the coefficients for distance, colony, landlocked and border dummies cannot be directly estimated. In the second case, μ_{ijk} is modelled as part of the error term. Since the Hausman specification test indicates that only the estimates of the within transformation are consistent, the random effect results are not shown.

Hence, the preferred specification includes bilateral-sectoral fixed effects, γ_{ijk}, and multilateral resistance terms and is given by:

$$\ln Exports_{ijkt} = \gamma_{ijk} + \alpha_1 \ln GDP_{ijt} + \alpha_2 \,\mathrm{CFAEZ}_{\mathrm{ijt}} + \alpha_3 \,\mathrm{EZCFA}_{\mathrm{ijt}} + \alpha_4 \, intraCFA_{ijt} + \alpha_5 \, RTA_{ijt} + \alpha_6 CU_{ijt} + \alpha_7 EURO_{ijt} + \delta_{kt} + \pi_{it} + \tau_{jt} + \varepsilon_{ijkt} \qquad (2)$$

where π_{it} and τ_{jt} are dummy variables that vary by origin and time and destination and time and are used as proxies for multilateral resistance terms.

As a robustness check we will also estimate the model with the dependent variable in levels (no logs) and using pseudo poisson maximum likelihood estimator to account for heteroscedasticity of the error term and for zero trade flows (Head and Mayer, 2014).

5. Empirical Results

[14] The currency union dummy variable takes the value zero when both countries are members of the CFA Franc Zone as the dummy variable for mutual CFA Zone membership already captures this.

5.1 Main results

Results for the GM estimations including all sectors are shown in Table 2. The first column shows results for specification (1) with time-and-sectoral dummies included with separated effects with and without France in the Euro-group and column (2) shows the results dropping the CFAFrance and FranceCFA dummy variable, to be able to show that the results of the EZCFA and CFAEZ dummies remain unchanged. This could indicate that whereas French trade with CFA countries is higher than with the rest of countries also after 1999, it is due to different reasons as to having a common currency. Columns (3) and (4) show the same set of results using a within estimator, which retains only the bilateral variation within sectors. Multilateral resistance terms (MRT) modelled as importer-and-time and exporter-and-time Fixed-Effects are included in all four columns.

To discuss the results, trade effects of the currency agreements are converted into percentage changes in trade. In columns (1) and (2) we observe that trade within the CFA area is 196[15] (184) percent higher than within other country groups after 1999.

The variables FranceCFA and CFAFrance are also indicating higher volumes of trade between France and CFA countries after 1999 in comparison to other country groups; however, this is not the case for trade between non-francophone Eurozone countries and CFA countries, which is not significantly different from trade among other country groups.

The estimates for the currency union effect (excluding the Euro) and the "separated" Euro effect are not statistically different from zero, whereas the regional trade agreement dummy indicates higher volumes of trade in the presence of trade agreements. The main drawback of these results is that some bilateral unobserved heterogeneity that is sector specific, could be biasing the results and for this reason columns (3) and (4) show the results of the within estimator for specification (2) in the previous section.

Estimates in column (3) show that intra-CFA trade within each sector is not higher after the implementation of the Euro in comparison to before, and exports from non-francophone countries to CFA

[15] The percentage change in trade is calculated as 196=(exp(1.084)-1)*100 using the coefficient of the intraCFA dummy in column (1) of Table 2, similarly for the corresponding coefficient in column (2).

countries are indeed lower within sectors after implementation of the Euro. However, both the Euro effect and the common currency effects are now positive and significant[16], which indicates that trade within the Eurozone is around 32 percent[17] higher than before the Euro and on average, within other currency unions, trade is around 16 percent higher than when the corresponding countries were non-members. Concerning other control variables, all show the expected sign and magnitudes and are statistically significant. The GDP cross-product has a significant positive impact on trade in all regressions shown in Table 2, with coefficients very close to the theoretical value of unity. Variables measuring distance, contiguity, common language, being landlocked and colonial relations are shown in columns (1) and (2) (in Table 2), but dropped from the FE regressions in columns (3) and (4) due to perfect collinearity with the FE as these variables do not vary over time. Distance between capitals has a significant negative impact on exports which is above unity. In addition, being landlocked presents the expected negative effect on exports, whereas contiguity of the two trading partners, common language and colonial relationship all have significant and positive effects on exports.

Table 2. Estimation results: Gravity model with time-varying Multilateral Resistance Terms

Dependent variable:				
ln exports	(1)	(2)	(3)	(4)
Estimation Method:	OLS-MRT	OLS-MRT	BSFE-MRT	BSFE-MRT
Explanatory variables:				
RTA	0.657***	0.655***	0.226***	0.226***
	[0.0349]	[0.0348]	[0.0190]	[0.0190]
CU	0.0523	0.0408	0.142**	0.146**
	[0.136]	[0.136]	[0.0644]	[0.0646]
EURO	-0.110	-0.101	0.284***	0.281***
	[0.120]	[0.120]	[0.0656]	[0.0657]
CFA	1.084***	1.044***	0.110	0.12
	[0.159]	[0.159]	[0.118]	[0.118]
EZCFA	0.0555	0.0397	-0.153**	-0.138**
	[0.0895]	[0.0890]	[0.0676]	[0.0671]
CFAEZ	-0.0992	-0.125	0.182	0.177
	[0.165]	[0.164]	[0.113]	[0.113]
FranceCFA	0.599***		-0.425***	
	[0.165]		[0.112]	
CFAFrance	0.812**		0.131	

[16] Estimates of the Euro effect are similar to Glick and Rose (2016) in Table 5, columns (3) and (5), indicating that adding dyadic fixed effects renders the Euro (EMU) effect positive and significant.

[17] The volume effect can be calculated in percentage terms using the estimate of the EURO variable in column (4) of Table 3 as [EXP(0.281)-1]=0.3244.

	[0.376]		[0.386]	
ln GDP	0.820***	0.820***	1.062***	1.062***
	[0.0289]	[0.0289]	[0.0248]	[0.0248]
ln Distance	-1.477***	-1.477***		
	[0.0177]	[0.0177]		
Landlock	-0.643***	-0.643***		
	[0.201]	[0.201]		
Colony	1.004***	1.037***		
	[0.0696]	[0.0684]		
ComLanguage	0.598***	0.602***		
	[0.0326]	[0.0325]		
Contiguity	0.760***	0.756***		
	[0.0748]	[0.0749]		
Sectoral-time FE	yes	yes	no	no
Bil-sector FE	no	no	yes	yes
Exp-time, imp-time FE	yes	yes	yes	yes
Observations	617,629	617,629	617,629	617,629
R-squared	0.579	0.579	0.114	0.114
Number of id			71,068	71,068

Robust standard errors clustered at the sectoral level in columns (1) and (2) and at the bilateral-sectoral level in columns (3) and (4) are in brackets. *** p<0.01, ** p<0.05, * p<0.1. BSFE denotes bilateral-sectoral fixed effects. MTR denotes multilateral resistance terms specified as exporter-time and importer-time dummy variables for 4 year periods. Estimations based on yearly data. "id" denotes number of bilateral-sectoral relationships.

Results for each individual sector are shown in Table 3 for model specification (2) with bilateral fixed effects and exporter-time and importer-time dummy variables. Estimated effects for CFA-EZ trade links differ to a large extent between sectors and by direction of the flow.

According to the estimates shown in Table 3 (column 1), exports from CFA Franc Zone members to Eurozone members are almost 50 (48.7) percent higher than before adoption of the Euro for agricultural products, whereas trade in the opposite direction –exports from Eurozone countries to CFA countries-- are 23 percent lower than before 1999. Exports from the Eurozone to the CFA Franc Zone yield insignificant estimates for the rest of the sectors, namely minerals, manufactures and differentiated goods.

Trade within the CFA zone is 54 percent higher after the adoption of the Euro for manufactured goods (according to results in Table 3). In particular, trade is 24 percent higher for homogenous and referenced priced goods and 106 percent higher for differentiated goods. Estimates for agricultural products (CFA variable) are positive but not statistically significant. Given that trade in manufactures accounts for around 40 percent of total trade within the CFA Franc Zone (Table 1), the overall effects for intra CFA Franc Zone trade flows can also be expected to be positive.

Concerning the effect of regional integration and the resulting reductions in trade barriers, we find a significant positive impact of RTAs on trade in all regressions, which ranges between an 18 and 80 percent increase across sectors. More specifically, the estimates in Table 3 for homogenous and reference priced goods (column 3, RTA variable) show the lowest increase in trade, whereas the highest increase is recorded for differentiated products (column 4, RTA variable). Mining products and agricultural goods show trade increases of 20 and 25 percent, respectively. Surprisingly, currency unions (CU) have a mostly insignificant effect on trade, with the only exception of homogenous and referenced price goods for which the effect is negative and significant, whereas the Euro effect is positive and significant for all sectors but one: homogenous and referenced price goods.

Table 3. Results by sector with multilateral resistance terms and without France

Dependent var: ln X	(1)	(2)	(3)	(4)
Fixed effects:	BSFE-MRT	BSFE-MRT-	BSFE-MRT	BSFE-MRT
Sectors:	Agricultural Goods	Minerals	Homo+Price Ref.	Differentiated
Explanatory variables				
Ln GDP	1.090***	1.393***	1.085***	0.495***
	[0.0374]	[0.0601]	[0.0337]	[0.0856]
RTA	0.174***	0.224***	0.165***	0.587***
	[0.0268]	[0.0411]	[0.0239]	[0.0657]
EURO	0.285***	0.300**	0.101	0.583***
	[0.0744]	[0.140]	[0.0666]	[0.158]
CU	0.0145	0.204	-0.120**	-0.0681
	[0.0634]	[0.127]	[0.0575]	[0.163]
CFA	0.191	-0.0517	0.219*	0.721***
	[0.202]	[0.273]	[0.130]	[0.237]
EZCFA	-0.266**	0.142	-0.109	-0.197
	[0.121]	[0.187]	[0.0804]	[0.222]
CFAEZ	0.397**	-0.220	0.293*	-0.216
	[0.164]	[0.262]	[0.177]	[0.331]
Constant	6.920	4.392***	7.806	11.39***
	[1,626]	[0.402]	[256.6]	[1.227]
Bilateral FE	yes	yes	yes	yes
Observations	186,469	122,824	216,534	91,802
R-squared	0.139	0.144	0.182	0.267
Number of id	20,166	14,945	21,841	14,116

Robust standard errors clustered at the bilateral-sectoral level are in brackets. *** p<0.01, ** p<0.05, * p<0.1. BSFE denotes bilateral-sectoral fixed effects. MTR denotes multilateral resistance terms specified as exporter-time and importer-time dummy variables for 4 year periods.

5.2 Robustness

In this section we present several robustness checks to validate our results. As a first robustness check, we include the results of a Pseudo Poisson Maximum Likelihood (PPML) estimator to control for the high number of zeroes and heteroscedasticity which might lead to inconsistent estimates (Santos Silva and Tenreyro, 2006). The main issue when using PPML is that the inclusion of time-varying multilateral resistance terms is infeasible with our sectoral dataset[18]. We can present results for the time-invariant MRT (origin and destination dummy variables) and also for a bilateral-sectoral fixed effects[19] estimator using data at 3 year intervals. The main results are shown in Tables A.4 and A.5 in the Appendix. Columns (1) and (2) in Table A.4 show the results with gravity variables and time-invariant MRT and columns (3) and (4) show the equivalent estimates using a log-log model (excluding the zeroes) for comparative purposes. Columns (5) and (6) in Table A.4 show the results with bilateral-sectoral fixed effects for all sectors and Table A.5 show similar estimates for each sector. The main results confirm the existence of a positive increase in intra CFA trade after 1999 in columns (1) and (2) of Table A.4 and for exports from France to the CFA Franc Zone and from CFA to France. The sectoral regressions in Table A.5 indicate that exports from CFA to France are higher in manufactured goods but lower in agricultural products (column 1), whereas export from non-francophone Eurozone countries are higher only in differentiated goods, but not significant in other sectors. The results are counter-intuitive and the no inclusion of time-variant MRT could be the main reason.

As a second robustness check, a replication of Table 7A in Frankel (2008) is shown in Table A.6 in the Appendix. Similar to Frankel (2008), we have included bi-directional time-variant effects for the trade flows between CFA countries and Eurozone countries, instead of separate effects for each direction of exports – CFAEZ and EZCFA– as in Tables 2 and 3 in the main results. Column (1) reports OLS results with time

[18] We have estimated the model with the ppml and xtpoisson Stata commands. The inclusion of time-varying MRT is feasible in smaller samples (as in Santos-Silva and Tenreyro, 2006, 2010), but not in our case. We also tried –without success– using data every 5 years, as suggested by Piermartini and Yotov (2016). See also Glick and Rose (2016) for similar problems when implementing PPML with large datasets. In page 16 Glick and Rose (2016) state "In working paper versions of this paper (available online), we also pursue Poisson pseudo maximum likelihood estimation of these models. We take these estimates less seriously, primarily because we have been unable to estimate an appropriate model for a reasonably large panel for purely computational reasons."

[19] As suggested by an anonymous referee, we introduce time invariant pair fixed effects that are sector specific in order to control for all time-invariant bilateral issues such as distance or language (see for example, Anderson et al, 2016 or Berman et al, 2012).

dummies, as in Frankel (2008)[20], column (2) adds dyadic (bilateral) FE and column (3) contains dyadic FE and multilateral resistance terms. The main results indicate that our comparable specification to Frankel (2008) reports positive and significant effects on trade between CFA and Eurozone countries after 1999 for all years; however, the results in Frankel (2008) are positive and significant from 1997 to 2003 but fade away every year after 2004 (see column 4 in Table A.7). When adding dyadic fixed effects in our sample, in column (2), the trade effects between CFA and Eurozone countries are all negative and significant and when controlling in addition for multilateral resistance terms, in column (3), the effects for the three first years of the Eurozone are positive and significant, but after 2001 the yearly effects are again negative and significant. Summarizing, with a theoretically justified specification of the GM, only small short run positive increases in CFA-Eurozone trade are found, which are more than compensated with negative effects after 2002.

Next, as a third robustness check, the results using an extended sample of 180 countries for the years 1973-2013 for aggregated exports and for selected sectors are presented in Table A.7 and a separation of the effects for the WAEMU and the CEMAC zones using the extended sample are presented in Table A.8. The list of countries is shown in Table A.9.

The results concerning the target variables, EZCFA and CFAEZ indicate that aggregated exports (column 1, Table A.7) are not significantly higher after the adoption of the Euro than before for trade flows between CFA and non-francophone Eurozone countries. The same is the case for non-energy exports and the results are even negative and significant in two occasions –for chemicals products exports from CFA to the Eurozone and other manufactures exports from the Eurozone to the CFA–. Concerning intraCFA trade flows, with this extended sample intraCFA exports appear to be 143 percent higher on average after the Euro adoption (column 1), due to increases in exports of most sectors apart from the chemical branch. Also

[20] For completeness column (4) reports the original estimates in Frankel (2008): Table 7A in page 31, with a comparable model specification to column (1) using our dataset and including distance. However, Frankel (2008) dataset is for the period 1948-2006 and his dependent variable is a country- pair's total bilateral trade, rather than unidirectional exports. Moreover, Frankel does not include distance, importer or exporter fixed effects in his gravity equation.

the Euro effect is positive and significant for aggregated exports, for exports of agricultural goods, raw materials and chemical products.

Finally, the results in Table A.8 indicate that the intraCFA trade effects found in Table A.7 for aggregated exports are mainly due to an increase in trade among WAEMU countries in all sectors, but the chemical one, after 1999, whereas the dummy for intraCEMAC exports presents a non-significant coefficient for aggregate exports, but positive and significant for three sectors, namely, food and raw materials and machinery and transport equipment (columns (3), (4) and (6)).

6. Conclusions

The results of this study shed light on sectoral differences and the general robustness of trade effects from currency unions, which are generally found to be heterogeneous across sectors and currency unions. In sharp contrast to findings obtained by other authors, we find that the elimination of nominal exchange rate volatility between the CFA Franc Zone and the Eurozone has not boosted total trade between countries of both zones to a similar level as for trade of the former sole anchor currency (France) with the CFA Franc Zone. However, for some types of goods the effect is significant and in a few cases positive when using a sample of sectoral trade at 2-digit level. At the same time, we find positive effects for trade within the CFA Franc Zone and for exports from the CFA Franc Zone to the Eurozone after the Euro adoption for agricultural goods and homogenous goods.

This finding is particularly interesting as the case of the CFA Franc Zone is one of the very few examples of fixed pegs where the currency decision can be assumed to be exogenous. We claim that the study by Frankel (2008) does not control for multilateral resistance and perhaps for this reason finds large and positive trade effects. This emphasizes that the potential bias present in studies investigating trade effects from exchange rate policies using traditional specifications of the gravity model of trade could be large.

It can also be seen as an indicator that unobserved factors, such as other trade-facilitating attempts beside RTAs, well established business links and trade networks, play a much more important role in this particular case of trade between Europe and Sub-Saharan Africa than exchange rate risks. France may

serve here as middleman that processes trade from other European countries through its trade network in order to overcome some of these unobserved factors. This has been facilitated by the introduction of the Euro as it has eliminated costs related to currency handling between other Eurozone members and France, and has possible driven the trade effects found in this paper. Investigating the role of France as a trade hub for Sub-Saharan Africa goes beyond the scope of this paper but provides interesting research opportunities for future studies.

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Appendix

Table A.1 List of Countries

Countries			
Albania	Egypt	Libya	Rwanda
Algeria	Eritrea	Lithuania	Saudi Arabia
Argentina	Estonia	*Luxembourg*	**Senegal**
Armenia	Ethiopia	Macao	Sierra Leone
Australia	Fiji	Macedonia	Singapore
Austria	***Finland***	Madagascar	Slovakia
Azerbaijan	***France***	Malawi	Slovenia
Bangladesh	**Gabon**	Malaysia	South Africa
Belarus	Gambia	**Mali**	***Spain***
Belgium	Georgia	***Malta***	Sri Lanka
Benin	***Germany***	Mauritania	Sudan
Bolivia	Ghana	Mexico	Suriname
Botswana	***Greece***	Morocco	Swaziland
Brazil	Guinea	Mozambique	Sweden
Bulgaria	**Guinea-Bissau**	Namibia	Switzerland
Burkina Faso	Haiti	Nepal	Syrian Arab Republic
Burundi cape verde	Hong Kong	***Netherlands***	Thailand
Cambodia	Hungary	New Zealand	**Togo**
Cameroon	Iceland	**Niger**	Tunisia
Canada	India	Nigeria	Turkey
Central African Republic	Indonesia	Norway	Uganda
Chad	Iran	Pakistan	Ukraine
Chile			
China	Iraq	Papua New Guinea	United Arab Emirates
Colombia	***Ireland***	Paraguay	United Kingdom
Congo	Israel	Peru	Tanzania
Cyprus	***Italy***	Philippines	United States of America
Czech Republic	Jamaica	Poland	Uruguay
Côte d'Ivoire	Japan	***Portugal***	Venezuela
Denmark	Jordan	Republic of Korea	Viet Nam
Djibouti	Kenya	Republic of Moldova	Yemen
Dominican Republic	Latvia	Romania	Zambia
Ecuador	Lesotho	Russian Federation	Zimbabwe

Notes: ***Bold+Italic*** *indicates Eurozone membership and* **bold+underlined** indicates *CFA membership. A * indicates*

Table A.2. List of Sectors and Codes

Code	Category	Description	Code	Category	Description
0	1	Live animals chiefly for food	58	3	Artificial resins and plastic materials, and cellulose esters etc
1	1	Meat and preparations	59	4	Chemical materials and products, nes
2	1	Dairy products and birds' eggs	61	4	Leather, leather manufactures, nes, and dressed furskins
3	1	Fish, crustacean and molluscs, and preparations thereof	62	4	Rubber manufactures, nes
4	1	Cereals and cereal preparations	63	4	Cork and wood, cork manufactures
5	1	Vegetables and fruit	64	3	Paper, paperboard, and articles of pulp, of paper or of paperboard
6	1	Sugar, sugar preparations and honey	65	4	Textile yarn, fabrics, made-up articles, nes, and related products
7	1	Coffee, tea, cocoa, spices, and manufactures thereof	66	4	Non-metallic mineral manufactures, nes
8	1	Feeding stuff for animals (not including unmilled cereals)	67	3	Iron and steel
9	1	Miscellaneous edible products and preparations	68	3	Non-ferrous metals
11	1	Beverages	69	4	Manufactures of metals, nes
12	1	Tobacco and tobacco manufactures	71	4	Power generating machinery and equipment
21	1	Hides, skins and furskins, raw	72	4	Machinery specialized for particular industries
22	1	Oil seeds and oleaginous fruit	73	4	Metalworking machinery
23	1	Crude rubber (including synthetic and reclaimed)	74	4	General industrial machinery and equipment, nes, and parts of, nes
24	1	Cork and wood	75	4	Office machines and automatic data processing equipment
25	1	Pulp and waste paper	76	4	Telecommunications, sound recording and reproducing equipment
26	1	Textile fibres (not wool tops) and their wastes (not in yarn)	77	4	Electric machinery, apparatus and appliances, nes, and parts, nes
27	2	Crude fertilizer and crude minerals	78	4	Road vehicles
28	2	Metalliferous ores and metal scrap	79	4	Other transport equipment
29	1	Crude animal and vegetable materials, nes	81	4	Sanitary, plumbing, heating, lighting fixtures and fittings, nes
32	2	Coal, coke and briquettes	82	4	Furniture and parts thereof
33	2	Petroleum, petroleum products and related materials	83	4	Travel goods, handbags and similar containers
34	2	Gas, natural and manufactured	84	4	Articles of apparel and clothing accessories
35	2	Electric current	85	4	Footwear
41	1	Animal oils and fats	87	4	Professional, scientific, controlling instruments, apparatus, nes
42	1	Fixed vegetable oils and fats	88	4	Photographic equipment and supplies, optical goods; watches, etc
43	1	Animal and vegetable oils and fats, processed, and waxes	89	4	Miscellaneous manufactured articles, nes
51	3	Organic chemicals	91	4	Postal packages not classified according to kind
52	2	Inorganic chemicals	94	1	Animals, live, nes, (including zoo animals, pets, insects, etc)
53	3	Dyeing, tanning and colouring materials	95	4	Armoured fighting vehicles, war firearms, ammunition, parts, nes
54	3	Medicinal and pharmaceutical products	96	3	Coin (other than gold coin), not being legal tender
55	4	Oils and perfume materials; toilet and cleansing preparations	97	2	Gold, non-monetary (excluding gold ores and concentrates)
56	3	Fertilizers, manufactured			
57	3	Explosives and pyrotechnic products			

Note: Categories 1, 2, 3 and 4 denote respectively agricultural products, minerals, homogenous and referenced priced manufactured products and differentiated manufactured products.

Table A.3 Variable, description and sources

Variable	Description	Source
ln Exportsijkt	Log of average yearly nominal exports of good k from country i to j at time t in current US$	UN Comtrade 2-digit SITC Rev. 2
ln GDPijt	Log of the cross-product of average nominal GDP of the countries i and j at time t in current US$	Penn World Tables
ln Distanceij	Log of distance between capitals of country i and j in km	CEPII
CFAEZijt	Dummy that takes the value of 1 if i is a CFA member and j is a Eurozone member at time t, 0 otherwise	BCEAO / BEAC / Eurostat
EZCFAijt	Dummy that takes the value of 1 if i is a Eurozone member and j is a CFA member at time t, 0 otherwise	BCEAO / BEAC / Eurostat
IntraCFAijt	Dummy that takes the value of 1 after 1999 if i and j are both CFA members, 0 otherwise	BCEAO / BEAC / Eurostat
CFAFranceijt	Dummy that takes the value of 1 after 1999 if i is a CFA member and j is France, zero otherwise	BCEAO / BEAC / Eurostat
FranceCFAijt	Dummy that takes the value of 1 after 1999 if i is France and importer j is a CFA member, 0 otherwise	BCEAO / BEAC / Eurostat
Borderij	Dummy that takes the value of 1 if i and j share a common border, zero otherwise	CEPII
Languageij	Dummy that takes the value of 1 if the same language is spoken by at least 9% of the population in i and j	CEPII
Landlockedij	Dummy that takes the value of 1 if i and j are landlocked, 2 if both are , 0 otherwise	CIA's World Factbook 2011
Islandij	Dummy that takes the value of 1 if i or j are islands, 2 if both are, 0 otherwise	CIA's World Factbook 2011
Colonyij	Dummy that takes the value of 1 if i is and j ever had a colonial link, 0 otherwise	CEPII
RTAijt	Dummy that takes the value of 1 if i and j have signed a RTA, 0 otherwise	De Sousa (2012)
CUijt	Dummy that takes the value of 1 if i and j have the same currency, 0 otherwise	De Sousa (2012)

Table A.4 PPML estimation results for all sectors

	PPML-MRT	PPML-MRT	OLS-MRT	OLS-MRT	PPML-BSFE	PPML_BSFE
	(1)	(2)	(3)	(4)	(5)	(6)
Dep. Variable:	Exports	Exports	Ln export	Ln Exports	Exports	Exports
Expl. Variables :						
RTA	0.576***	0.576***	1.208***	1.205***	-0.00714	-0.00712
	[0.0551]	[0.0551]	[0.0593]	[0.0593]	[0.0381]	[0.0381]
COMCUR	-0.0834	-0.0872	0.297	0.298	-0.00465	-0.00458
	[0.0729]	[0.0729]	[0.272]	[0.273]	[0.0336]	[0.0335]
EURO	0.161**	0.164**	1.336***	1.337***	0.0753**	0.0753**
	[0.0818]	[0.0820]	[0.247]	[0.247]	[0.0370]	[0.0370]
CFA	2.020***	1.737***	0.0273	0.0240	0.165	0.165
	[0.286]	[0.286]	[0.204]	[0.204]	[0.164]	[0.164]
EZCFA	0.135	-0.0382	0.722***	0.719***	0.0973	0.0973
	[0.148]	[0.160]	[0.146]	[0.146]	[0.0909]	[0.0909]
CFAEZ	0.274	0.162	-0.200	-0.202	-0.126	-0.126
	[0.293]	[0.291]	[0.215]	[0.215]	[0.0985]	[0.0985]
FranceCFA	1.759***		2.053***		-0.140*	
	[0.189]		[0.279]		[0.0735]	
CFAFrance	1.379***		0.659		0.123	
	[0.262]		[0.519]		[0.362]	
ln GDP	1.270***	1.268***	0.619***	0.619***	1.319***	1.319***
	[0.0780]	[0.0780]	[0.0117]	[0.0117]	[0.0718]	[0.0718]
Ln distance	-0.669***	-0.669***	-0.425***	-0.426***		
	[0.0264]	[0.0264]	[0.0258]	[0.0258]		
Landlocked	1.358***	1.357***	-0.944***	-0.943***		
	[0.327]	[0.327]	[0.0339]	[0.0339]		
Colony	0.127	0.133	1.910***	1.971***		
	[0.0856]	[0.0858]	[0.121]	[0.119]		
Common language	0.287***	0.292***	0.0834	0.0872		
	[0.0616]	[0.0616]	[0.0574]	[0.0574]		
Contiguity	0.578***	0.576***	2.385***	2.377***		
	[0.0684]	[0.0683]	[0.110]	[0.110]		
Constant	9.482***	9.489***	13.84***	13.85***		
	[0.782]	[0.782]	[0.241]	[0.241]		
MRT	yes	yes	yes	yes		
BLFE					yes	yes
Observations	486,504	486,504	199,558	199,558	271,428	271,428
R-squared			0.249	0.249		
Number of id					59,572	59,572

Note: Robust standard errors in brackets clustered at the bilateral-sectoral level. *** p<0.01, ** p<0.05, * p<0.1. Data at 3 year intervals. PPML denotes Pseudo Poisson Maximum Likelihood. MRT denotes multilateral resistance terms, which are proxied with exporter and importer fixed effects. BSFE denotes bilateral-sectoral fixed effects. CFAEZ is a dummy variable that takes the value of 1 if i is a CFA member and j is a Eurozone member –excluding France– at time t, 0 otherwise. EZCFA is dummy variable that takes the value of 1 if i is a Eurozone member –excluding France– and j is a CFA member at time t, 0 otherwise. CFAFrance takes the value of 1 after 1999 if i is a CFA member and j is France, zero otherwise. FranceCFA takes the value of 1 after 1999 if *i* is France and importer *j* is a CFA member, 0 otherwise. The rest of variables are defined in Table A.3. id denotes the cross-section identifier, which is origin-destination-sector.

Table A.5. Sectoral Results using PPML

	(1)	(2)	(3)	(4)
Dep Var.:	XAgri	XRawm	XHomo	XDiff
Expl. Var.:				
RTA	0.0402	-0.0705	-0.0165	0.309**
	[0.0301]	[0.0731]	[0.0435]	[0.125]
COMCUR	-0.0637	-0.192**	0.0181	0.809***
	[0.0558]	[0.0835]	[0.0361]	[0.258]
EURO	0.152**	0.0742	0.0647	-0.0962
	[0.0624]	[0.129]	[0.0406]	[0.238]
CFA	0.252	-0.392	0.210	0.137
	[0.307]	[0.420]	[0.137]	[0.291]
EZCFA	0.113	0.540	0.0677	-0.453
	[0.0935]	[0.348]	[0.105]	[0.344]
CFAEZ	-0.130	-0.296	0.0910	3.450***
	[0.100]	[0.297]	[0.139]	[0.795]
FranceCFA	0.0461	-0.421*	-0.140	2.694***
	[0.0580]	[0.253]	[0.0858]	[0.269]
CFAFrance	-0.403***	-0.191	1.182**	0.795***
	[0.134]	[0.404]	[0.578]	[0.210]
ln GDP	0.733***	0.994***	1.395***	0.531***
	[0.0906]	[0.129]	[0.0875]	[0.181]
BFE	yes	yes	yes	yes
Year FE	yes	yes	yes	yes
Observations	79,001	56,521	86,423	49,483
Number of id	17,339	12,306	19,099	10,828

Note: Robust standard errors in brackets clustered at the bilateral-level. *** p<0.01, ** p<0.05, * p<0.1. Data at 3 year intervals. BFE denotes bilateral fixed effects. CFAEZ is a dummy variable that takes the value of 1 if i is a CFA member and j is a Eurozone member –excluding France– at time t, 0 otherwise. EZCFA is dummy variable that takes the value of 1 if i is a Eurozone member –excluding France– and j is a CFA member at time t, 0 otherwise. CFAFrance takes the value of 1 after 1999 if i is a CFA member and j is France, zero otherwise. FranceCFA takes the value of 1 after 1999 if i is France and importer j is a CFA member, 0 otherwise. The rest of variables are defined in Table A.3. id denotes the cross-section identifier, which is origin-destination-sector.

Table A.6. Replication of Table 7A in Frankel (2008) with sectoral data

	OLS	BIL_FE	BSFE-MRT	OLS, Frankel (2008)
	(1)	(2)	(3)	(4)
Dep. Var:	Exports	Exports	Exports	X_Aggregated
Expl. Var:				
RTA	1.210***	0.201***	0.162***	1.940***
	[0.0589]	[0.0197]	[0.0191]	[0.182]
COMCUR	0.243	0.273***	0.156**	1.710***
	[0.257]	[0.0810]	[0.0647]	[0.389]
EURO	1.063***	0.132*	0.163**	0.229*
	[0.237]	[0.0783]	[0.0711]	[0.138]
CFA	-0.152	0.0647	0.179	-0.726*
	[0.211]	[0.107]	[0.218]	[0.439]
CFAEZ_95	-0.498***	-0.268***	-0.241	0.237
	[0.0674]	[0.0464]	[0.188]	[0.166]
CFAEZ_96	-0.550***	-0.193***	-0.164	0.079
	[0.0650]	[0.0460]	[0.187]	[0.158]
CFAEZ_97	-0.582***	-0.225***	-0.202	0.640***
	[0.0626]	[0.0429]	[0.185]	[0.226]
CFAEZ_98	-0.496***	-0.105**	-0.0611	0.549**
	[0.0646]	[0.0411]	[0.185]	[0.222]
CFAEZ_99	0.145***	-0.202***	**0.0982****	0.508**
	[0.0455]	[0.0198]	[0.0422]	[0.222]
CFAEZ_00	0.280***	-0.150***	**0.148*****	0.450**
	[0.0465]	[0.0206]	[0.0422]	[0.223]
CFAEZ_01	0.225***	-0.133***	**0.142*****	0.546**
	[0.0451]	[0.0207]	[0.0412]	[0.223]
CFAEZ_02	0.237***	-0.164***	-0.213***	0.519**
	[0.0457]	[0.0214]	[0.0480]	[0.226]
CFAEZ_03	0.314***	-0.119***	-0.172***	0.428*
	[0.0457]	[0.0222]	[0.0480]	[0.233]
CFAEZ_04	0.331***	-0.0791***	-0.137***	0.437*
	[0.0465]	[0.0229]	[0.0479]	[0.235]
CFAEZ_05	0.310***	-0.103***	-0.168***	0.22
	[0.0488]	[0.0241]	[0.0482]	[0.238]
CFAEZ_06	0.470***	-0.0168	-0.145***	0.178
	[0.0481]	[0.0239]	[0.0399]	[0.246]
CFAEZ_07	0.338***	-0.0318	-0.151***	
	[0.0470]	[0.0239]	[0.0396]	
CFAEZ_08	0.114**	-0.0462*	-0.171***	
	[0.0477]	[0.0246]	[0.0392]	
CFAEZ_09	0.0989**	-0.0506**	-0.175***	
	[0.0476]	[0.0253]	[0.0399]	
Ln GDP	0.607***	0.811***	0.603***	0.813***
	[0.0116]	[0.0238]	[0.0307]	[0.016]
Ln distance	-0.434***			-
	[0.0254]			-
Landlocked	-0.986***			-0.267***
	[0.0334]			[0.049]
Colony	1.973***			1.004***
	[0.120]			[0.149]
Com. language	0.119**			0.358***
	[0.0565]			[0.073]
Contiguity	2.387***			2.515***
	[0.110]			[0.134]
Observations	617,629	617,629	617,629	169,561
R-squared	0.251	0.086	0.118	0.40
Number of id		71,068	71,068	

Note: Robust standard errors clustered at the bilateral level are in brackets. *** p<0.01, ** p<0.05, * p<0.1. BSFE denotes bilateral-sectoral fixed effects. MTR denotes multilateral resistance terms specified as exporter-time and importer-time dummy variables for 4 year periods. Estimations based on yearly data. CFAEZ is a dummy variable that takes the value of 1 if i is a CFA member and j is a Eurozone member –excluding France– at time t, 0 otherwise and also when i is a Eurozone member –excluding France– and j is a CFA member at time t, 0 otherwise. The rest of variables are defined in Table A.3. id denotes the cross-section identifier, which is origin-destination-sector.

Table A.7 Estimation results for the extended sample: 1973-2013

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dep. Variable:	Ln X	Ln Xnoen	Ln Xfood	Ln Xrawm	Ln Xche	Ln Xmachtr	Ln Xotherm
Exp. Var.:							
COMCUR	0.179*	0.194*	0.00548	-0.0261	0.0510	-0.404***	0.000474
	[0.107]	[0.105]	[0.119]	[0.147]	[0.131]	[0.117]	[0.108]
RTA	0.255***	0.255***	0.301***	0.300***	0.0980**	0.214***	0.200***
	[0.0304]	[0.0299]	[0.0381]	[0.0458]	[0.0390]	[0.0372]	[0.0342]
EURO	0.164**	0.181**	0.722***	0.450***	0.344***	0.0520	0.0350
	[0.0832]	[0.0816]	[0.111]	[0.132]	[0.110]	[0.106]	[0.0922]
CFA	0.887***	0.808***	1.309***	1.554***	0.274	1.230***	1.096***
	[0.254]	[0.262]	[0.367]	[0.379]	[0.392]	[0.275]	[0.304]
EZCFA	-0.129	-0.197*	-0.00865	0.0958	-0.258	-0.206	-0.333***
	[0.121]	[0.117]	[0.168]	[0.235]	[0.162]	[0.152]	[0.126]
CFAEZ	-0.347	-0.204	0.137	-0.185	-4.052***	-0.470	0.251
	[0.272]	[0.275]	[0.365]	[0.286]	[0.902]	[0.415]	[0.325]
BFE-MRT	yes	yes	yes	yes	yes	yes	yes
Observations	102,181	101,528	70,646	60,439	59,186	67,510	76,773
R-squared	0.438	0.449	0.382	0.292	0.425	0.461	0.367
Number of id	23,238	23,102	17,265	15,685	15,007	17,297	18,994

Note: Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1. Regressions results for 5-year interval data. BFE denotes bilateral fixed effects. MTR denotes multilateral resistance terms specified as exporter-year and importer-year dummy variables. X denotes total exports, Xnoen excludes energy exports, Xfood denotes exports in agricultural products, Xrawmat exports in raw materials, Xche in chemical products, Xmachtr in machinery and transport equipment and Xotherm in other manufacturing industries. CFAEZ is a dummy variable that takes the value of 1 if i is a CFA member and j is a Eurozone member –excluding France– at time t, 0 otherwise. EZCFA is dummy variable that takes the value of 1 if i is a Eurozone member –excluding France– and j is a CFA member at time t, 0 otherwise. The rest of variables are defined in Table A.3. id denotes the cross-section identifier, which is origin-destination.

Table A.8. Estimation results including separated effects for WAEMU and CEMAC for 1973-2013

Dep. Variable:	(1) Ln X	(2) Ln Xnoen	(3) Ln Xfood	(4) Ln Xrawm	(5) Ln Xche	(6) Ln Xmachtr	(7) Ln Xotherm
Expl. Variables:							
COMCUR	0.140	0.172	-0.0238	-0.0520	0.0109	-0.382***	0.0531
	[0.107]	[0.106]	[0.119]	[0.147]	[0.136]	[0.116]	[0.112]
RTA	0.254***	0.253***	0.301***	0.298***	0.0997**	0.215***	0.199***
	[0.0304]	[0.0299]	[0.0381]	[0.0458]	[0.0390]	[0.0372]	[0.0342]
EURO	0.179**	0.186**	0.733***	0.459***	0.366***	0.0378	0.00602
	[0.0834]	[0.0817]	[0.110]	[0.132]	[0.110]	[0.106]	[0.0932]
WAEMU	1.030***	0.957***	1.134***	1.403***	0.475	0.723**	0.985***
	[0.307]	[0.320]	[0.431]	[0.467]	[0.496]	[0.334]	[0.353]
CEMAC	0.873	0.762	1.973***	1.396*	0.896	1.324**	1.225
	[0.604]	[0.596]	[0.740]	[0.796]	[1.005]	[0.524]	[0.765]
EZWAEMU	-0.309**	-0.372***	-0.0115	-0.304	-0.558***	-0.211	-0.339**
	[0.139]	[0.136]	[0.180]	[0.233]	[0.214]	[0.157]	[0.139]
EZCEMAC	-0.113	-0.0490	-0.0527	0.201	-0.419*	-0.414*	-0.0951
	[0.160]	[0.158]	[0.241]	[0.247]	[0.238]	[0.228]	[0.182]
BFE-MRT	yes	yes	yes	yes	yes	yes	yes
Observations	102,181	101,528	70,646	60,439	59,186	67,510	76,773
R-squared	0.438	0.449	0.382	0.292	0.425	0.461	0.367
Number of id	23,238	23,102	17,265	15,685	15,007	17,297	18,994

Note: Robust standard errors in brackets, *** p<0.01, ** p<0.05, * p<0.1. Regressions results for 5-year interval data. BFE denotes bilateral fixed effects. MTR denotes multilateral resistance terms specified as exporter-year and importer-year dummy variables. X denotes total exports, Xnoen excludes energy exports, Xfood denotes exports in agricultural products, Xrawmat exports in raw materials, Xche in chemical producst, Xmachtr in machinery and transport equipment and Xotherm in other manufacturing industries. WAEMU (CEMAC) are dummy variables that take the value of 1 if country i and j are WAEMU (CEMAC) members after 1999, 0 otherwise. EZWAEMU is a dummy variable that takes the value of 1 if i is a WAEMU member and j is a Eurozone member –excluding France– at time t, and also when i is a Eurozone member –excluding France– and j is a WAEMU member at time t, 0 otherwise. EZCEMAC is dummy variable that takes the value of 1 if i is a Eurozone member –excluding France– and j is a CEMAC member at time t, and when i is a CEMAC member and j is a Eurozone member –excluding France– at time t, 0 otherwise. The rest of variables are defined in Table A.3.

Table A.9. Country List. Extended sample

Afghanistan	Dem. Rep. of Korea	Kiribati	Saint Kitts and Nevis
Albania	Denmark	Kuwait	Saint Lucia
Algeria	Djibouti	Kyrgyzstan	Saint Vincent and the Grenadines
Angola	Dominica	Lao People's Dem. Rep.	Samoa
Antigua and Barbuda	Dominican Rep.	Latvia	Sao Tome and Principe
Argentina	Ecuador	Lebanon	Saudi Arabia
Armenia	Egypt	Lesotho	Senegal
Australia	El Salvador	Liberia	Seychelles
Austria	Equatorial Guinea	Libya	Sierra Leone
Azerbaijan	Eritrea	Lithuania	Singapore
Bahamas	Estonia	Madagascar	Slovakia
Bahrain	Ethiopia	Malawi	Slovenia
Bangladesh	FS Micronesia	Malaysia	Solomon Isds
Barbados	Faeroe Isds	Maldives	Somalia
Belarus	Fiji	Mali	South Africa
Belgium	Finland	Malta	Spain
Belize	France	Mauritania	Sri Lanka
Benin	Gabon	Mauritius	Sudan
Bermuda	Gambia	Mexico	Suriname
Bhutan	Georgia	Mongolia	Swaziland
Bolivia	Germany	Morocco	Sweden
Bosnia Herzegovina	Ghana	Mozambique	Switzerland
Botswana	Greece	Myanmar	Syria
Brazil	Greenland	Namibia	TFYR of Macedonia
Brunei Darussalam	Grenada	Nepal	Tajikistan
Bulgaria	Guatemala	Netherlands	Thailand
Burkina Faso	Guinea	New Zealand	Togo
Burundi	Guinea-Bissau	Nicaragua	Tonga
Cambodia	Guyana	Niger	Trinidad and Tobago
Cameroon	Haiti	Nigeria	Tunisia
Canada	Honduras	Norway	Turkey
Cape Verde	Hungary	Oman	Turkmenistan
Central African Rep.	Iceland	Pakistan	USA
Chad	India	Panama	Uganda
Chile	Indonesia	Papua New Guinea	Ukraine
China	Iran	Paraguay	United Arab Emirates
Colombia	Iraq	Peru	United Kingdom
Comoros	Ireland	Philippines	United Rep. of Tanzania
Congo	Israel	Poland	Uruguay
Costa Rica	Italy	Portugal	Vanuatu
Croatia	Jamaica	Qatar	Venezuela
Cuba	Japan	Rep. of Korea	Viet Nam
Cyprus	Jordan	Rep. of Moldova	Yemen
Czech Rep.	Kazakhstan	Russian Federation	Zambia
Côte d'Ivoire	Kenya	Rwanda	Zimbabwe