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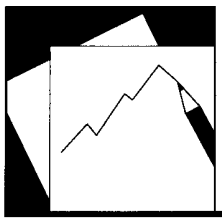

IMF Working Paper

Feeling The Elephant's Weight: The Impact of Côte d'Ivoire's Crisis on WAEMU Trade

Philippe Egoume and Ankouvi Nayo

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AFR

Feeling The Elephant's Weight: The Impact of Côte d'Ivoire's Crisis on WAEMU Trade

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Abstract

This paper analyzes the impact of political instability in Côte d'Ivoire on WAEMU trade over 1990–2007, applying panel econometric techniques to a gravity model of trade within WAEMU and between WAEMU and the rest of the world. The paper finds that intra-regional trade represents a small share of total WAEMU trade and that Côte d'Ivoire accounts for around half of that total, highlighting the importance of this country for the region. The political instability in Côte d'Ivoire has led to an increase in transaction costs, making it relatively more costly for member countries to trade with each other than with the rest of world. Instability has also resulted in a diversion of trade away from Côte d'Ivoire in favor of other countries equipped with ports and in a reduction of WAEMU overall potential trade. For Côte d'Ivoire alone, lost trade is estimated at around 40 percent of its potential trade with the WAEMU in the absence of instability. With a normalization in Côte d'Ivoire, enhanced security and further integration would be essential to achieve higher levels of trade and growth in the WAEMU region.

JEL Classification Numbers: F14, F15, F17

Keywords: Trade, integration, political instability, gravity models, WAEMU, Côte d'Ivoire

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I. INTRODUCTION

International trade is important for achieving high growth and development. Many theories have been put forth to explain the determinants of international trade, some supporting free trade, others, more protectionist, rationalizing why trade should be regulated. In recent decades free trade has gained the upper hand and agreements based on this principle have multiplied worldwide, mainly through free trade zones and regional common market areas.[2] The international community has found value in promoting free trade worldwide and has tasked the World Trade Organization (WTO) to promote trade liberalization.

Trade liberalization and integration within regional country groups seems to be the avenue followed by most countries sharing common borders, history, culture, or language. The West African Economic and Monetary Union (WAEMU) is one such entity, bringing together mostly francophone countries. But is the WAEMU a catalyst for trade among its members, and therefore an important tool for development? To help answer this, we look at how the fortunes, and misfortunes, of the largest economy in the region, Côte d'Ivoire, may have affected the trade and growth performance of the whole group. This may be particularly relevant because Côte d'Ivoire has suffered from political instability since 1999 when the president was overthrown by a military coup. The instability worsened in 2002 when civil war erupted, splitting the country into the government-controlled south and the rebel-run north.

The main objective of this study is to determine whether and how WAEMU trade and integration were impacted by the crisis in Côte d'Ivoire by analyzing data available for 1990– 2007. Section II reviews the literature; Section III presents the conceptual framework of the analysis; Section IV discusses WAEMU trade flows; Section V analyzes the typology of trade partners based on a multiple correspondence analysis; Section VI estimates a gravity model of WAEMU trade and discusses its results; Section VII analyzes the impact of political instability in Côte d'Ivoire on WAEMU trade; and Section VIII draws lessons and concludes.

II. LITERATURE REVIEW

A. Theoretical Studies

Among empirical trade theories, the gravity model is well known for its success in bilateral trade studies. Its fame stems from its similarity with Newton's gravity model, which states that the attraction between two objects is proportional to their masses and inversely proportional to the distance between them. Applying this to trade, the theory is that the amount of trade between two countries is proportional to the size of their economies and inversely proportional to the distance between them. There are several versions, which augment the basic specification with additional control variables to account for proximity

[2] For instance the European Union and the WAEMU.

such as using the same language, common historical background, cultural affinity, political variables, or trade agreements. Tinbergen (1962) proposed the following gravity model:

$$M_{ij} = f(Y_i, Y_j, E_{ij}),$$

where M_{ij} is the value of the trade flows between countries i and j; Y_i (Y_j) is the nominal gross domestic product of country i (or j) and E_{ij} is a vector of other determinants of trade such as the distance between i and j, or agreements between countries. Bergstrand (1985) criticized the model for its lack of price variables, stressing their role in equating supply and demand. He introduced price and exchange rate variables through capital and labor endowments and income per capita.

Model specification

In its simplest expression (Tinbergen, 1962; Linneman, 1966), bilateral trade flows (T) depend on the product of the incomes (Y) of both partners, i and j, divided by the distance (D) between them:

$$T_{ij} = A \frac{Y_i^{\beta_1} Y_j^{\beta_2}}{D_{ij}^{\beta_3}} \quad \textbf{(1.1)}$$

Taking the logarithm, the equation becomes:

$$\ln\left(T_{ij}\right) = \alpha + \beta_1 \ln\left(Y_i\right) + \beta_2 \ln\left(Y_j\right) + \beta_3 \ln\left(D_{ij}\right)$$

where $\beta_1, \beta_2, \beta_3$ are elasticities. This equation is augmented by control variables to take into account some specificities (absence of common borders, belonging to a free trade zone, etc.) that could be determinants of trade.

B. Empirical Studies

The gravity trade model has been applied widely to different situations and geographical areas with great success. Disdier and Mucchielli (2001) carried out a trade integration analysis of Balkan countries during the 1990s taking into account border effects. This methodology measures trade between two countries, taking as reference intra-national trade and assessing the effect of borders as obstacles to trade. They establish that the reorientation of individual country trade strategy toward the EU has diverted trade between Balkan countries. Trotignon (2005), using a gravity model with panel data, assessed the consequences of the free trade agreement signed in the 1990s between 11 Latin American countries. He found that trade liberalization between these countries intensified intra-zone trade. Egoume and Mendis (2002) found that CARICOM, composed of 19 Caribbean countries, promoted trade and that further integration among themselves was a winning strategy. Josselin and Nicot (2003), studying trade among EU countries, explicitly took into account foreign direct investment and showed that the impact of distance was different depending on the degree of contiguity of the countries. Xubei LUO (2001) tested the fitness of the gravity model as it applied to trade between Chinese provinces and Japan from 1988 to

1997. He found that beyond distance as an obstacle, the quality of the transportation infrastructure is a key determinant of trade.

III. Conceptual Framework

A. Data Description

We use annual data for 10 countries—the eight WAEMU countries plus Ghana and Guinea—so from now on for simplicity WAEMU refers to all 10 countries[3]. The reason for this extension is not only the geographical proximity of Ghana and Guinea to WAEMU countries but, more importantly, the size of their trade transactions with WAEMU countries, particularly during the crisis in Côte d'Ivoire. As we will see later, during the crisis Ghana's ports became important outlets for landlocked WAEMU countries. The rest of the world is composed of regions with which WAEMU countries trade, namely the EU, South East Asia and North America.

Trade data are from the IMF Direction of Trade database; real and nominal gross domestic product (GDP) (base year 2000) are from the IMF World Economic Outlook (WEO) database. Density is proxied by population. Distance is measured between capital cities. When needed, and depending on data availability, we use dummy or polytomic variables that could explain the trade trend between the countries. These are availability of shoreline; sharing a common border; and, when possible, the quality of transportation infrastructure. The period considered spans 18 years, 1990–2007. Special attention is devoted to the coastal countries of the WAEMU, which could have taken advantage of trade diverted from Côte d'Ivoire by political instability. (See Annex 1 for further data description.)

B. Trade Partners

The data have a "bi-transversal" dimension and a time dimension. The bi-transversal dimension concerns pairs of trade partners. In fact, for a given country *i* we observe bilateral trade flows with each of the other *j* partners and vice versa by rotating countries *i* and *j*. In this manner, we consider pairs of trade partners as the observation unit. For each pair, we examine total bilateral trade flows (imports plus exports). We observe these pairs each year.

C. Establishing a Typology of Trade Partners

To determine the interrelations between the intra-WAEMU trade flows and flows between WAEMU countries and other blocs, like the European Union and South East Asia, we carry out a factor analysis using multiple correspondences analysis. This technique makes it possible to identify clusters and establish a typology of trade partners.
To implement this analysis we consider for each year the quartiles of the distribution of transactions between different trading partners. We consider trade flows in the first quartile

[3] Ghana, an English-speaking country, is surrounded by French speaking WAEMU member countries Burkina Faso, Côte d'Ivoire, and Togo. Guinea, a French-speaking country is not a WAEMU member, but shares borders with WAEMU member countries Côte d'Ivoire, Mali, and Senegal.

as *low*; the second quartile as *medium*; the third one as *high*; and the last quartile as *very high*. Partners whose trade level was on average unchanged will belong to the same quartile during the whole period under consideration. For purposes of multiple correspondences analysis, pairs of countries will be gathered and will be closest to the quartile to which they belong. Those whose trade flows would have intensified or been diverted during the observation period will shift from one quartile to another.

D. The Gravity Model

Use of the gravity model as methodology is essential to underline some specificities of the bilateral relation: sharing the same border, belonging to the same monetary union, and distance from one another. In principle, given the multiple numbers of countries and several years of observation, the data fit the panel estimation. However, use of a panel model is possible only if the observed units behave the same way (even if they have some individual specificities). Therefore we need to run specification tests to determine whether the process that generated the data could be considered as homogenous. The panel model would be appropriate only if this condition is met. The endogenous variable is bilateral trade flows. After estimating a general gravity model, we will examine the signs of the variables based on the expected signs and economic theories.

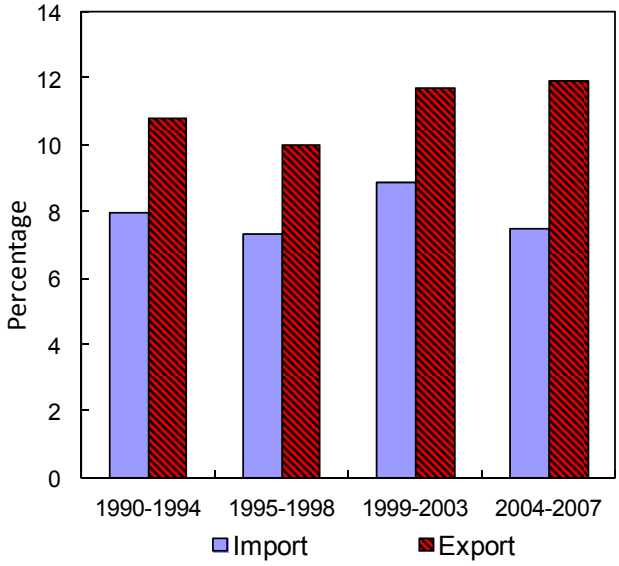
IV. Descriptive Analysis of WAEMU Trade

A. Intra-WAEMU Trade: A Small Share of Total WAEMU Trade

WAEMU countries share the same currency and have established institutions and regulations to foster economic integration, such as regional tariff agreements and tax harmonization. Although they are not part of the group, Ghana and Guinea trade extensively in relative terms with WAEMU member countries. However, relative to trade with the rest of the world, particularly beyond Africa, trade flows within WAEMU are low.

Over the observation period, the share of intra-WAEMU exports in total WAEMU exports averaged about 11 percent (Figure 1). It declined by 1 percentage point to 10 percent after the CFA franc devaluation in 1994, but later increased to about 12 percent. The average share of imports hovered around 8 percent, some 4 percentage points lower than the export share because overall imports are higher than exports. From 2004 to 2007, the intra-WAEMU import share decreased significantly, perhaps because the decline of imports from Côte d'Ivoire may have been replaced by imports from outside the zone and by further trade liberalization.

Figure 1. Share of Intra-WAEMU Trade in Total WAEMU Trade



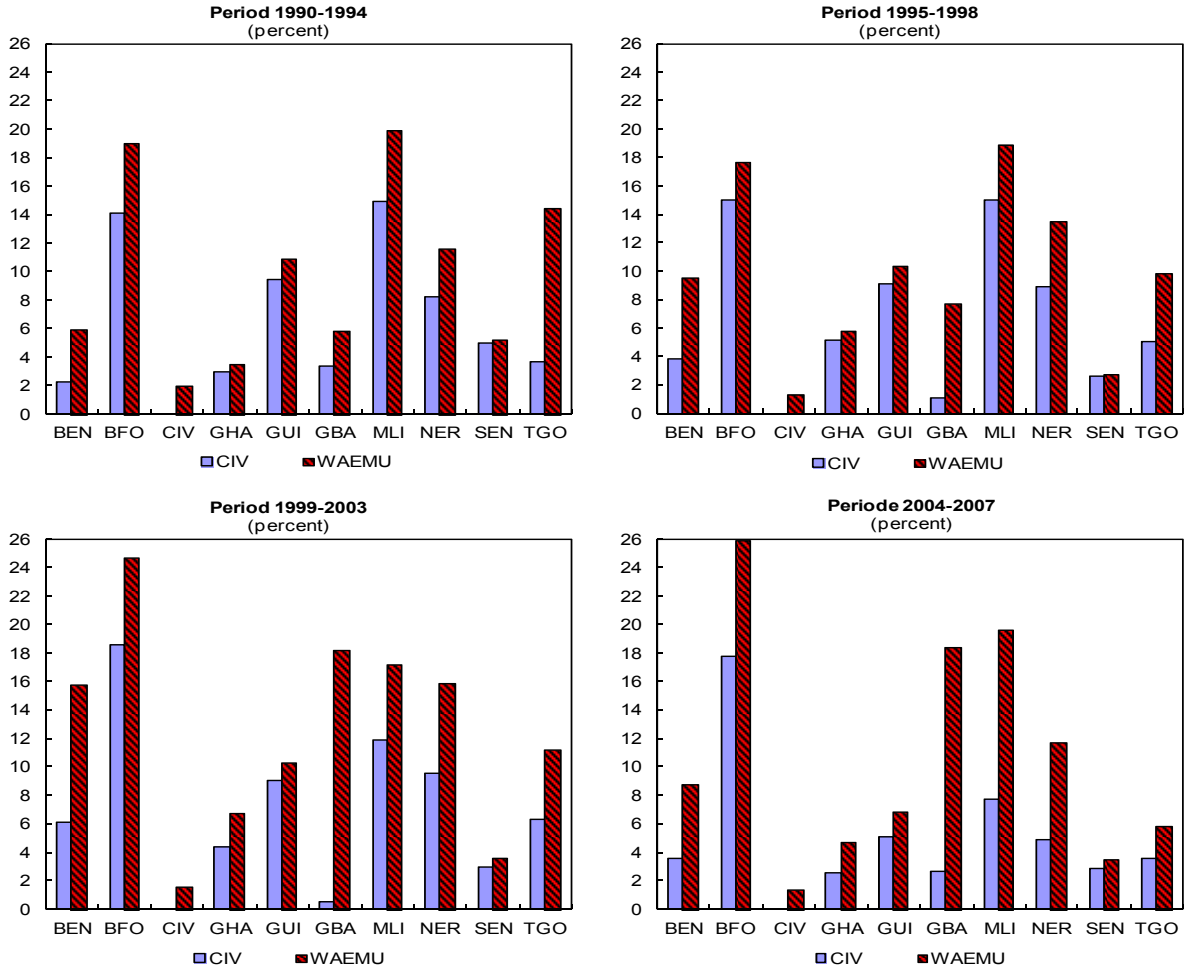
B. Côte d'Ivoire's Role in Regional Trade

1. Largest Supplier Within the WAEMU

Within the WAEMU, Côte d'Ivoire provides the largest share of intra-zone imports. Among WAEMU countries it has the largest manufacturing base, particularly in agro-industry. It has the largest and most technologically advanced oil refinery in West Africa, supplying oil products to all of its neighbors. Côte d'Ivoire is also the only one to export electricity, which goes to Burkina Faso, Mali, and Ghana. Figure 2 depicts the share of WAEMU country imports from within WAEMU and specifically from Côte d'Ivoire over four sub-periods of the period under consideration. WAEMU countries, particularly Burkina Faso and Mali, receive a substantial share of their imports from Côte d'Ivoire; in contrast, Côte d'Ivoire imports the least from the region—less than 2 percent of its total imports, which did not increased during the entire period under consideration.

Although Côte d'Ivoire has been the largest supplier in the WAEMU over time, for 2004–07 WAEMU country shares of imports from Côte d'Ivoire generally declined, certainly due to its instability and further trade liberalization, which both led to trade diversion.

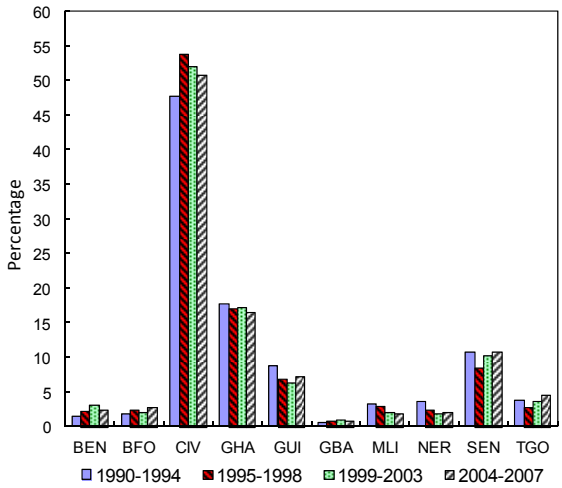
Figure 2. Share of Imports from WAEMU Countries and from Côte d'Ivoire



2. Largest WAEMU Exporter

Côte d'Ivoire is the WAEMU economic powerhouse. It represents more than 50 percent of all WAEMU exports, and despite the political instability related to the civil war, this ratio has not changed much. The reason is that agriculture, the basis for Côte d'Ivoire's exports, was largely unaffected by the civil war. The country remains the largest cocoa producer in the world—with about 40 percent of market share—exports substantial quantities of coffee, cotton, and food staples, and has become the largest exporter of raw cashew nuts in the world. During the period under consideration, Côte d'Ivoire's crude oil production increased substantially, providing another reason why it has maintained the largest share of exports. Ivorian manufacturing industries are concentrated in the south around Abidjan, the main city, and were unaffected by the civil war, which took place much farther to the north. Also the Port of Abidjan, the largest in West Africa, continued to operate normally, although it lost a large part of its business with countries in the hinterland at the height of the crisis. However, the share of Côte d'Ivoire in WAEMU exports may be eroding slightly (see Figure 3). It declined from close to 55 percent during 1995–99 to about 50 percent during 2004–07. This probably reflects the increase in exports from the other WAEMU countries.

Figure 3. Share of Country Exports in Total WAEMU Exports



Source: IMF data for 1990–2007 and authors' calculations.

V. TYPOLOGY OF TRADE PARTNERS

To begin with we needed to verify that the set of bilateral trade data and data for control variables we had assembled would fit a panel structure—i.e. that the trade model behavior would not change across countries and time. We ran homogeneity tests, which suggested that the data set taken as a whole did not fit a panel structure (Table 1). Indeed the Fisher statistics' value is greater than the threshold value; and the value of the probability of the test is close to zero. The model cannot be fitted to the whole data. We therefore decided to undertake a factor analysis of the data to find out whether different subsets would fit such a structure and allow us to conduct robust estimations.

Table 1. Homogeneity Test on the Data Set

	Panel structure test for bilateral trade between all countries		
	Fisher statistics	Critical value or F	P-value
Testing for global *homogeneity: pooled model* (P1)	26.7	F(525, 836)=1	0
Testing for *homogeneity* of the coefficients of independent variables (P2)	4.3	F(450, 836)=1	1.03E-74
Testing for *homogeneity* of the constant for all individuals (P3)	74.7	F(75, 1286)=1.3	0

Box 1. Implementation of Factor or Correspondence Analysis

Correspondence analysis is a descriptive/exploratory technique designed to analyze simple two-way and multi-way tables containing some measure of correspondence between the rows and columns. In this case, the purpose of correspondence analysis is to classify trade partners into groups. The analysis is as follows:

Trade partners are observed by pairs of countries and over time. The advantage of this approach is to identify at once both groups of trade partners and trade dynamics between them—the evolution of trade flows over time.

a) The variables considered are the value of trade flows observed between two countries (year after year from 1990 to 2007) and characteristics of partner countries (e.g., possession of a common border, belonging to a same currency union, possession of a coastline).

b) The appropriate analysis here is multiple correspondence analysis (MCA) because it assigns pairs of trade partners in different quartiles. Trade partners within groups are homogeneous (exhibit the same behavior). MCA projects individuals and variables in the same factorial plan. Each individual is projected at the barycenter position of all the modalities that it possesses. And each modality is at the barycenter position of all the individuals that possess this modality.

$$F_s(i) = (1/\sqrt{\lambda_S}) \sum_j (1/Q) * (k_{ij} - (k_j / I)) * G_s(j)$$

$$G_s(j) = (1/\sqrt{\lambda_S}) \sum_i (k_{ij} / k_j) * F_s(i)$$

Where

- $F_s(i)$: the factorial coordinates of individual *i,* which is characterized by a subset of modalities (out of the *J* modalities available) on the *S* axis
- $G_s(j)$: the factorial coordinates of a particular modality that characterizes a subset of individuals (out of the *I* individuals present) on the *S* axis
- λ_S : the eigenvalue of axis *S*
- *kij* : the number of individuals that possess the j modality only
- *kj:* the number of individuals that possess the j modality, regardless of other modalities they may possess
- Q: the number of variables

We use membership in a monetary union and sharing a common border as additional variables to confirm groups identified by the MCA.

Figures 4 and 5 show results of the MCA. Figure 4 represents trade quartiles. Starting from the North-East panel and continuing clockwise, it shows intensifying bilateral trade. For example, observation T-1990_1 (T=Trade; 1990=the year of observation; and 1= the first quartile) means the lowest value of trade observed in 1990. It represents the 25 per cent of partners that do trade the least. Hence, countries in this quartile during the period of study will be on the same side of Figure 5. In Figure 5, partners are identified by a code. For example CIVMIL represents bilateral trade partners CIV (Côte d'Ivoire) and MIL (Mali).

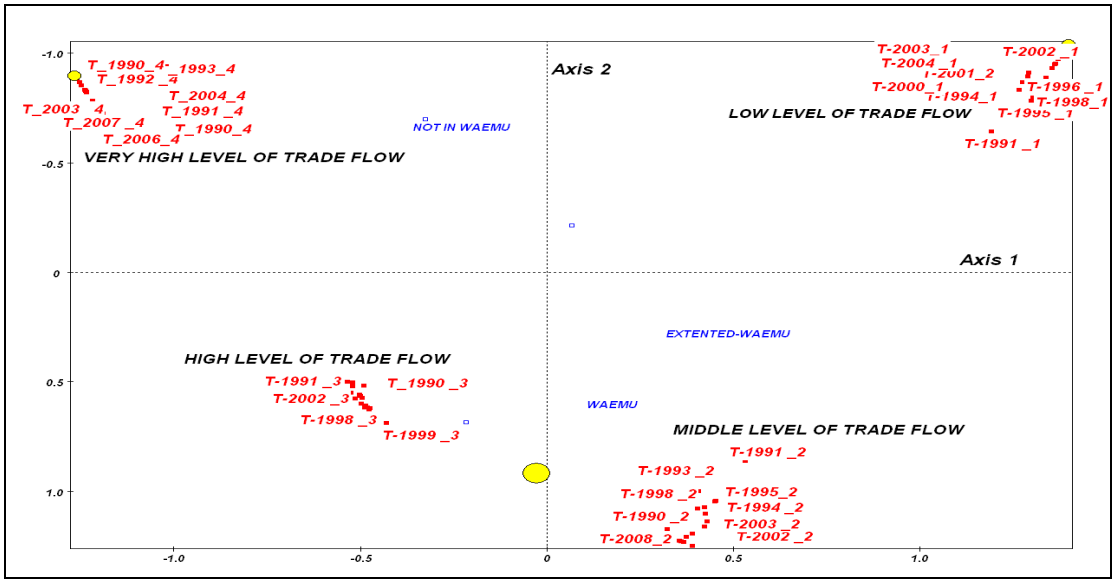
Three classes emerge from this analysis.

- The first group consists of countries doing the least trade from 1990 to 2007. Most country pairs that belong to this class have on one side WAEMU countries and on the other Guinea or North America.

- The second group, whose trade can be qualified as medium, is composed mainly of pairs of WAEMU countries. Interestingly, although the distances between their capital cities are on average shorter than for other pairs of countries, these pairs do not exhibit the highest trade levels, except for Côte d'Ivoire/Burkina Faso, Côte d'Ivoire/Mali, Côte d'Ivoire/ Ghana, and Côte d'Ivoire/Guinea.

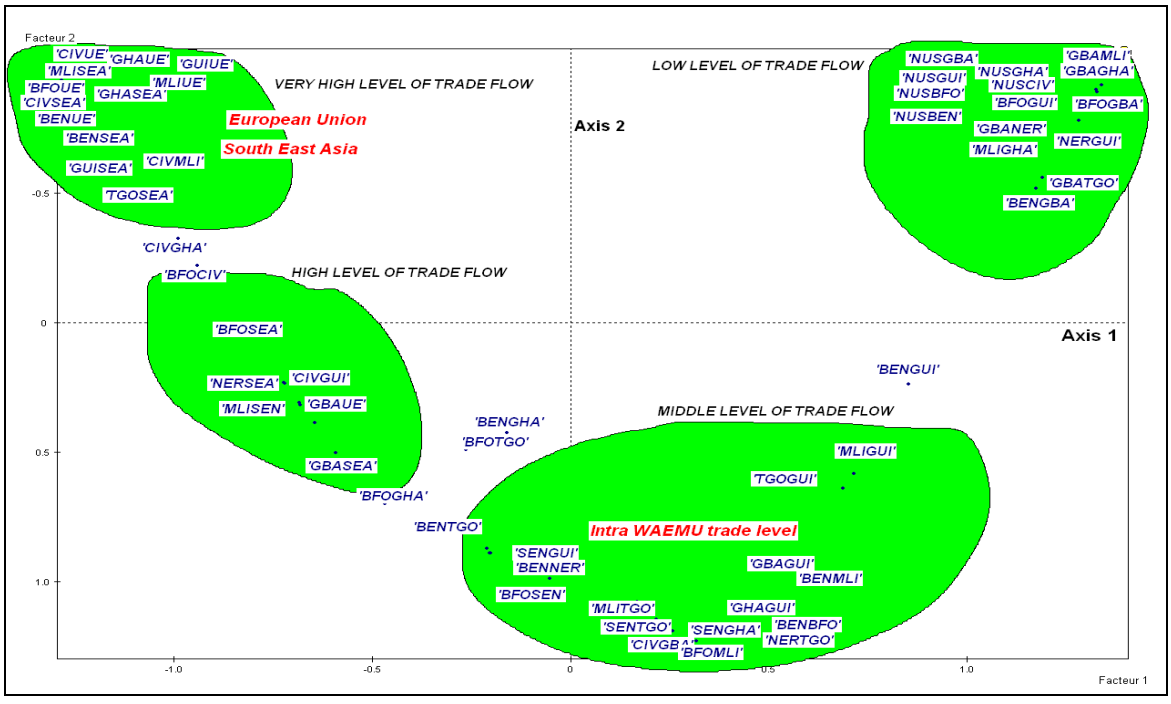
- The third class is composed of country pairs whose trade is either high level or very high level. The two groups are brought together because many of their pairs have exhibited similar behavior over time. In contrast to the second group, the distances between their capital cities are the farthest. Pairs in this class usually consist of one partner from either the EU or South Asia and the other from the WAEMU. Notably, Guinea, which trades the least with WAEMU countries, has the highest trade level with the EU and South Asia.

Figure 4. Typology of Partition in Three Classes from the MCA (Trade Flow Levels)



Source: IMF data, 1990–2007.

Figure 5. Typology of Partition in Three Classes (Selected Trade Partners)



Source: IMF data and authors' calculations.

The MCA shows that there was no intensification of trade within the WAEMU during the observation period, as the countries' pairs remain bunched up in the second quartile.

VI. ESTIMATION OF THE GRAVITY MODEL

After performing a number of tests for the validity of the model, it appears that generalized least squares (GLS) with random effects, heteroskedasticity correction, and intra-individual autocorrelation is the most appropriate model for our estimation using panel data (Table 2).

Table 2. Tests of Model Validity

Test for Validation of the Model	Null Hypothesis	Critical Value or F	P-value*
Breusch and Pagan Lagrangian multiplier test for random effects	Random effects are not significant.	chi2(1) = 889.5	0.00
White heteroskedasticity test	Errors are homescedastic.	F(5,174) = 4841.8	0.00
Autocorrelation intra-individual	No first-order autocorrelation	F(1, 9) = 1.62	0.23
Heteroskedasticity between individuals	sigma(i)^2 = sigma^2 for all *i*, i.e. variance of residual is constant	chi2 (10) = 2535.7	0.00
Correlation between individuals	Errors are independent.	179.841	0.00

* If p-value>0.05, the null hypothesis cannot be rejected at that threshold.

On this basis we estimate an augmented gravity model with. The estimated model is the following (for the definition of variables see Annex 1):

$$\log(X_{ijt} + M_{ijt}) = \beta_0 + \beta_1 * \log(GDP1_{ijt}) + \beta_2 * \log(GDP2_{ijt}) + \beta_3 * \log(gdpt1_{ijt}) + \beta_4 * \log(gdpt2_{ijt}) + \beta_5 * \log(dist_{ij}) + \beta_6 \,\text{int}\, egration_{ij} + \beta_7 border_{ij} + \varepsilon_{ijt}$$

with $\varepsilon_{ijt} = \mu_{ij} + \eta_{ijt}$.

where

- μ_{ij} is the error due to the pairs of individuals, which does not depend on time variation.
- η_{ijt} is the error due to both the pair of individuals and the time variation.

ε_{ijt} must verify the conditions below:

$$E(\varepsilon_{ijt}) = 0$$

$$E(\varepsilon_{ijt}\varepsilon_{ijs}) = \begin{cases} \delta_\varepsilon^2, if, t = s \\ 0, \forall, t \neq s \end{cases}$$

$$E(\varepsilon_{ijt}\varepsilon_{lks}) = 0$$

A. Homogeneity Panel Tests

The specification tests run on the three classes identified in the typology conclude that the panel structure does not fit the data in classes 1 and 2 of the typology; only class 3 qualifies as a panel. Nevertheless, since the aim of this study is not only to estimate trade flows between WAEMU countries and the rest of the world but also to examine trade flows within WAEMU, we chose another approach for the latter. We consider trade flows between each individual WAEMU country and the whole region (regional trade), instead of flows between pairs within the WAEMU (bilateral trade). The homogeneity test shows that this new structure fits a panel data structure (Table 3). We therefore estimate the model on two sets of data: classes 2 and 3.

Table 3. Specification Tests for Panel Estimation

	Bilateral Trade Between WAEMU Countries	Regional Trade Between WAEMU Countries	Bilateral Trade Between WAEMU Countries and South East Asia or the European Union
Testing for global *homogeneity : pooled model* (P1)	0	0	0
Testing for *homogeneity* of the coefficients of independent variables (P2)	0	0.033	0.32
Testing for *homogeneity* of the constant for all individual (P3)	0	0	0

B. Interpretation of Results and Comparisons

The results (see Table 4) show that all the coefficients are significant at 95 percent except the variable "maritime coast" in equation (1), with expected signs. GDP and GDP per capita of the partners have a positive effect on trade flows and distance between their capitals has a negative effect. The null hypothesis that the coefficients of equations (1) and (2) are the same is rejected, meaning that the effects of independent variables are different in the intra-WAEMU trade equation than in the equation for WAEMU trade with the EU and South Asia.

Indeed, the impact of GDP and GDP per capita is stronger for intra WAEMU trade than for South Asia and European Union, which is predicted by the gravity model because they are neighbors. However, this effect seems to be mitigated by the effect of distance. The elasticity of distance is more than twice as large in the intra-WAEMU equation than in the equation for trade between WAEMU and the rest of the world. This suggests that transaction costs are higher within WAEMU. In fact, it might be said that WAEMU countries are geographically close but economically distant from each other. This may be due to poor transportation infrastructure, weak or corrupt public trade administrations, racketeering by armed forces and other transaction costs—all of which were probably exacerbated by the instability in Côte d'Ivoire, the largest economy and trading partner in the region. Inconsistency between supply and import demand inside the region may also be a factor, leading WAEMU countries to increasingly turn to non-WAEMU suppliers. The large negative elasticity of distance may also explain why intra-WAEMU trade stagnated over the study period.

Possession of a seacoast also contributes to increasing trade with the EU and South Asia but does not have any impact on intra-WAEMU trade. In fact, most ships passing through the Gulf of Guinea are on their way to Europe, America, or Asia. There is a dearth of smaller ships for regional transportation, so that transactions between WAEMU countries by sea are minimal. In addition, since most landlocked WAEMU countries (Burkina Faso, Mali, and Niger) trade with the rest of the world through the port of Abidjan in Côte d'Ivoire, possession of a coastline for other WAEMU countries was not statistically important.

Table 4. Coefficients for the GLS Panel Estimation (Dependent Variable = log(X+M))

Independent variables	Regional Trade Between WAEMU Countries (1)	Bilateral Trade Between WAEMU Countries and South East Asia or European Union (2)	Comparison: Null Hypothesis Difference Between the Coefficients of (1) and (2)
Log(GDP1)	0.77***	0.69***	0***
	(14.46)	-102.95	
Log(GDP2)	0.66***	0.47***	0***
	(6.91)	-11.28	
Log((GDP1/hab1)	0.25**	0.17***	0***
	(2.70)	-12.74	
Log(GDP2/hab2)	0.56***	0.08**	0***
	(4.19)	-2.32	
Coast	0.08	0.69***	0***
	(0.71)	-36.21	
Log(distance)	-1.97***	-0.76***	0***
	(-7.95)	(-8.59)	
Constant	-15.55***	-4.45**	0***
	(-3.44)	(-2.75)	

* significant at 10% ;** significant at 5%; *** significant at 1%.

VII. Impact of the Ivorian Crisis on Trade Within WAEMU

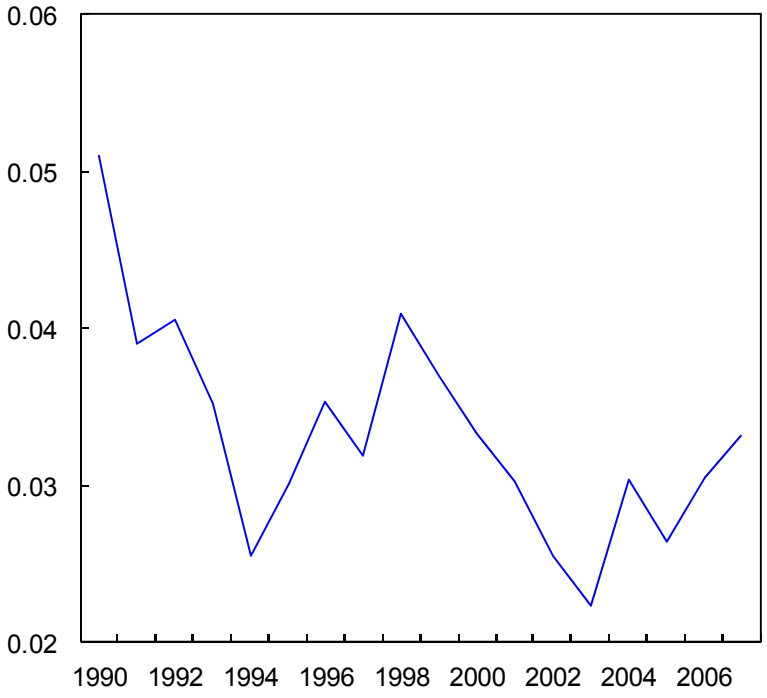
The purpose of this section is to examine whether WAEMU trade has been negatively affected by the Ivorian crisis and to quantify the loss.

A. Import Developments for Other WAEMU Countries

It appears that WAEMU countries tended to import less from Côte d'Ivoire during the period under study (Figure 6). In fact, there seem to have been four well-defined sub-periods: a plunge from 1990 through 1994, reflecting the worsening subpar growth throughout in the region that eventually led to the CFAF devaluation; a strong recovery between 1995 and 1999 as import demand rode the post-devaluation economic rebound; another sharp drop from 1999 through 2004 as political instability in Côte d'Ivoire reduced import demand from

the WAEMU; and a healthy recovery since 2004 as the political situation in Côte d'Ivoire gradually stabilized. But over the entire study period, the import propensity (see Annex 2) declined, a trend that is likely to be confirmed as other WAEMU countries become reliable suppliers and trade liberalization deepens (see Table A.3).

Figure 6. Average Propensity of WAEMU Members to Import from Côte d'Ivoire



Sources: IMF data, 1990–2007, authors' calculations.

B. Estimation of Crisis Effects

To measure the impact of political instability in Côte d'Ivoire on intra-WAEMU trade we first estimate three models and test them using the information criteria to determine which one is best suited for this exercise. Then we run the chosen model on the different groups of data previously identified and on the pre-instability period and periods. Finally, we analyze the results and estimate the aggregate loss of trade due to instability.

- Model 1 consists in introducing a dummy variable into the estimation. This variable takes the value of 1 during the instability period and 0 otherwise. We consider two instability periods, the first from 1999 (the year of the coup) to 2002 (the year the civil war erupted); the second from 1999 to 2007 (the end of the observation period).
- Model 2 consists in introducing a dummy variable for each year (relative to a reference year that is excluded from the regression); this makes it possible to see in which year trade increased or declined.
- In model 3, we estimate the same model for two different periods: the period before political instability and the instability periods as defined above.

In each approach, other variables related to political instability were added in the estimated equation. These are instrumental variables, because we assume that they are closely linked to political instability and the nature of the political regime in each specific country. The instruments are a dummy referring to the political instability period and a dummy for each country.

We compare the estimated models based on the Akaike and Schwarz information criteria and the endogeneity test (see Table 5). The results suggest that model 3 is the most suitable for estimating the impact of political instability in Côte d'Ivoire on WAEMU trade.

Table 5. Information Criteria Test for Selection of the Best Model

Test1:endogeneity test			Test2: choice of the best model				
			Model 1		Model 2	Model 3*	
			Crisis period 1999-2002	Crisis period 1999-2007		Subperiod 1990-1998	Subperiod 1999-2007
chi2(11)	150.57	Akaike's information criterion	286.2	271.6	285.0	137.7	96.5
Prob>chi2	0.00	Schwarz's information criterion	314.0	299.4	356.0	171.3	130.0

* The model that minimizes the information criterion.

1. Intra-WAEMU Trade

This model estimates the impact of political instability in Côte d'Ivoire on trade between each WAEMU country and all the other WAEMU partners (Table 6).

- It finds that the impact of GDP and GDP per capita over the instability period is negative (against the prediction of the gravity model). This suggests that compared to the pre-instability period, the amount of trade decreased, probably due to the costs of having to go around Côte d'Ivoire. Indeed at the height of the crisis, countries of the hinterland (Burkina Faso, Mali, and Niger) that previously had the majority of their exports and imports transit through Côte d'Ivoire had to use longer routes through Ghana, Togo, or Senegal. In these circumstances the bigger the economy, the higher the trade transactions and transaction costs. This is therefore consistent with a negative elasticity of GDP in the gravity model.

- As the results show, sharing a common border with Côte d'Ivoire, which prior to instability had a strong positive effect on trade, became insignificant during the instability period.

- The effect of possessing a coastline more than quadrupled during the instability period. This natural endowment was of little statistical significance so long as Côte d'Ivoire dominated transactions with the hinterland. However, as soon as the hinterland needed new trade outlets, possession of a coastline became crucial to attracting this new business and to trade generally.

- It appears that after 1999, when the instability period kicked in with the military coup, the negative impact on trade peaked in 2000 and then gradually abated as the political situation in Côte d'Ivoire began to return gradually to normalcy.

Table 6. GLS Panel Estimation of Intra-WAEMU Trade (1990–98 and 1999–2007)

	Coefficients (.) Student's T		Null hypothesis: Difference Between the Coefficients Is not Significant (t test) P-value
	1990–98	1999–2007	
Log(GDP1)	0.64* (1.71)	-2.47*** (-4.83)	0***
Log(GDP2)	0.94 (1.62)	-25.55*** (-3.69)	0***
Log(GDP1 per capita)	-0.53** (-2.13)	-0.91** (-2.16)	0***
Log(GDP2 per capita)	1.40*** (3.26)	-7.35** (-2.36)	0***
Coast	0.43* (1.70)	2.11*** (7.2)	0***
Common border with Côte d'Ivoire	1.66** (6.49)	0.46 (1.3)	0***
Bureaucracy_quality	0.1 (1.11)	-1.60 (-1.5)	
Composite_risk_rating	-0.01 (-0.66)	0.02 (0.13)	
Democratic_accountability	0.05 (0.81)	-0.06 (-1.19)	
Corruption	-0.08 (-1.05)	-0.21 (-0.13)	
Burkina Faso	-0.68*** (-3.08)	1.30*** (4.36)	0***
Guinea-Bissau	-0.66 (-0.77)	-6.53*** (-5.64)	0***
Ghana	-0.01 (-0.01)	-1.33 (-1.53)	0***
Guinea	-1.34*** (-3.26)	-0.99** (-2.72)	0***
Senegal	0.80** (2.09)	0.00 (-0.01)	0***
Togo	0.56** (2.21)	-2.94*** (-6.00)	0***
Year 1999		-18.71*** (-3.99)	
Year 2000		-20.01*** (-4.67)	
Year 2001		-17.93*** (-4.9)	
Year 2002		-15.69*** (-4.96)	
Year 2003		-12.49*** (-4.57)	
Year 2004		-9.73*** (-4.34)	
Year 2005		-6.70*** (-4.64)	
Year 2006		-3.43*** (-5.13)	
Cons	-39.42 (-1.52)	1176.63*** (4.05)	

* significant at 10%;** significant at 5%; *** significant at 1%

[+] Distance was dropped because of collinearity.

2. Côte d'Ivoire's Trade with WAEMU Countries

This regression estimates trade flows between Côte d'Ivoire and the rest of the WAEMU (Table 7).

- The impact of distance between Côte d'Ivoire and neighboring trade partners, which before the instability was of no statistical significance because of the advantages of Côte d'Ivoire's superior infrastructure and port, had a very strong negative effect during the instability. This certainly reflects the surge in the transaction costs of dealing with Côte d'Ivoire during the political instability period.

- Possession of a coastline, which before the instability period had no significant effect when trading with Côte d'Ivoire, became a trade dampener for Côte d'Ivoire, because Ghana, Senegal, and Togo, which have coastlines and decent ports, attracted the trade that formerly went to or through Côte d'Ivoire. The silver lining for Côte d'Ivoire,

however, is that from 2004, the year effect grew gradually, as trade and stability returned to normal.

- Sharing a common border had been a strong positive determinant of Côte d'Ivoire trade with WAEMU before its political instability, but thereafter this effect lost any statistical significance, again reflecting the diversion of trade away from Côte d'Ivoire.

Table 7. GLS Panel Estimation for Côte d'Ivoire Trade with WAEMU (1990–98 and 1999–2007) [+]

	Coefficients		Null hypothesis: Difference Between the Coefficients Is not Significant (t test) P-value
	1990–98	1999–2007	
Log(GDP2)	1.06*** (10.68)	0.40*** (6.63)	0***
Log(gdpt2)	-0.91*** (-3.66)	0.72*** (5.92)	0***
Log(distCIV)	-0.22 (-1.53)	-0.83*** (-7.34)	0***
CIV coastline	0.33 (1.51)	-0.38*** (-4.04)	0***
Common border with Côte d'Ivoire	0.42*** (2.95)	-0.06 (-0.66)	0***
Year 1991	-0.63** (-2.8)		
Year 1992	-0.16 (-0.72)		
Year 1993	-0.49** (-2.11)		
Year 1994	-1.30*** (-4.19)		
Year 1995	-1.33*** (-4.36)		
Year 1996	-1.24*** (-3.94)		
Year 1997	-1.52*** (-4.47)		
Year 1998	-3.94*** (-4.52)		
Year 1999		-0.31* (-1.76)	
Year 2004		0.31* (1.75)	
Year 2005		0.35** (1.97)	
year 2006		0.46**(2.63)	
Year 2007		0.55*** (3.11)	
Cons	3.37* (1.82)	12.40*** (8.94)	

* significant at 10%;** significant at 5%; *** significant at 1%

[+] Côte d'Ivoire GDP and GDP per capita were dropped because of collinearity.

3. Côte d'Ivoire's Trade with South East Asia and the European Union

Trade flows between Côte d'Ivoire and the EU and South East Asia seem to have been affected also by the instability in Côte d'Ivoire. Indeed, looking at the whole period, the year effect becomes negative from 1994 on. In that year, imports should have declined markedly because of the devaluation. In 1999, the year of the coup d'Etat, the negative effect on trade nudges up, peaking in 2001 before gradually abating.

Generally speaking, instability year coefficients are all negative, which is evidence that trade expansion was slowed. Instability has therefore been detrimental to trade, and certainly to growth in Côte d'Ivoire, particularly in its relation with the EU and South East Asia.

Table 8. GLS Panel Estimation of Côte d'Ivoire's Trade with South East Asia and the European Union (Dependent Variable log(X+M))

	Coefficients (.) Student's T		
	1990–2007	1999–2007	1999–2007
Log(GDP1)	1,72*** (15,93)	0.300** (2.66)	
Log(GDP2)	-0,67*** (-7,75)	0.517*** (5.92)	0.737*** (341.9)
Year 1991	0,31*** (3,40)	0.009 (0.098)	
Year 1992	0,41*** (4,02)	0.130 (1.592)	
Year 1993	0,27** (2,69)	-0.024 (-0.29)	
Year 1994	-0,43*** (-4,85)	-0.117 (-1.64)	
Year 1995	-0,22** (-2,47)	0.188* (2.56)	
Year 1996	-0,50*** (-5,37)	0.270*** (3.69)	
Year 1997	-0,88*** (-9,17)	-0.040 (-0.45)	
Year 1998	-0,67*** (-6,71)		
Year 1999	-0,81*** (-7,89)		-0.769*** (-8.87)
Year 2000	-0,85*** (-8,54)		-0.904*** (-10.4)
Year 2001	-0,88*** (-8,56)		-0.853*** (-9.84)
Year 2002	-0,81*** (-7,72)		-0.717*** (-8.28)
Year 2003	-0,52*** (-5,04)		-0.463*** (-5.34)
Year 2004	-0,31*** (-3,08)		-0.289*** (-3.33)
Year 2005	-0,30*** (-2,96)		-0.251** (-2.9)
Year 2006	-0,18* (-1,96)		-0.135 (1.6)

* significant at 10%;** significant at 5%; *** significant at 1%

C. Trade Losses Due to Instability in Côte d'Ivoire

The evidence in the previous section of the negative impact of political instability in Côte d'Ivoire on regional trade is compelling. In this section we estimate the value of Côte d'Ivoire's trade (exports plus imports) with the rest of the WAEMU that was lost because of the civil war. We also estimate the overall trade losses for the WAEMU. We posit that the political instability period started with the coup in 1999 and continued until 2007, the last year of observation. We assume that without the political instability trade between Côte d'Ivoire and its partners in the WAEMU would have behaved as it did before the crisis, so the elasticities would have been the same. We estimate the gravity model on data for trade between Côte d'Ivoire and its WAEMU partners first for 1990–98 and then for 1999–2007. We calculate the predicted value of trade in 1999–2007 using in turn elasticities obtained for 1999–2007 and 1990–98. The difference in predicted value provides an estimate of the loss in Côte d'Ivoire's trade with the WAEMU during the political instability period. These losses (*Diff*) are determined by

$$Diff = \sum_{i=1}^{9}\left(\sum_{t=1999}^{2007}(X_{it}\hat{\beta}_{99\_2007}) - \sum_{t=1999}^{2007}(X_{it}\hat{\beta}_{90\_98})\right)$$

$$Diff = \hat{y}_{99\_2007} - \breve{y}_{99-2007}$$

where:

- $\widehat{y}_{99\_2007}$ is the predicted flows of trade of Côte d'Ivoire with the rest of the WAEMU for 1999–2007, derived from the gravity model estimation based on the observations from 1999 to 2007;

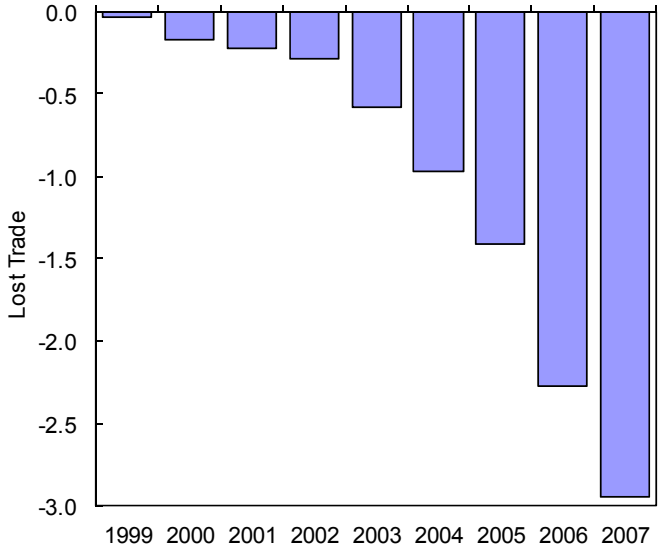
- $\breve{y}_{99\_2007}$ is the predicted flows of trade of Côte d'Ivoire with the rest of the WAEMU for 1999–2007, derived from the gravity model estimation based on the observations from 1990 to 1998; and

- *n* is the number of Côte d'Ivoire's trade partners.

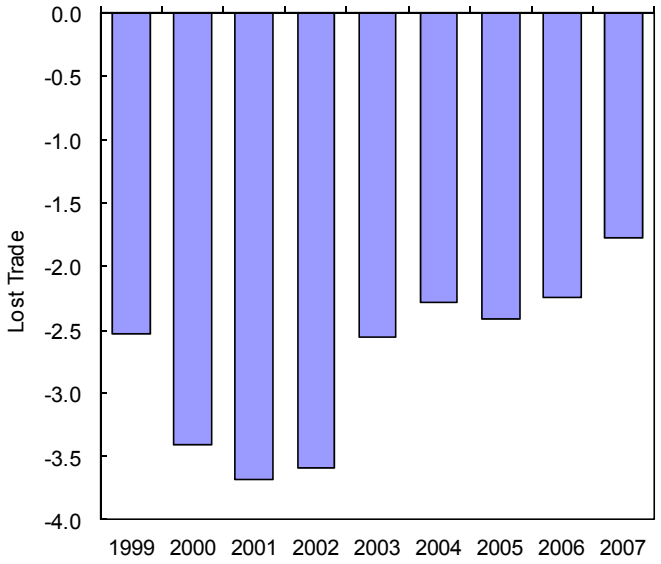
As illustrated in Figure 7, Côte d'Ivoire's cumulative losses in terms of trade volume with its WAEMU partners during the instability period are estimated to be around US$8.7 billion against total actual aggregate intra-WAEMU trade flows of around US$15 billion. Trade losses for the whole of WAEMU due to instability in Côte d'Ivoire are estimated to be around US$9.5 billion. This suggests that if the political situation had been stable, intra-WAEMU trade during that time would have been around US$24.5 billion. Therefore the lost trade represents some 39 percent of potential trade. Côte d'Ivoire alone accounts for over 90 percent of the lost trade volume. It appears that the lost trade for Côte d'Ivoire has been permanent to a large extent, and has increased over time. At the same time Côte d'Ivoire's lost trade has resulted in trade gains for other WAEMU countries, mitigating aggregate losses for the whole region over time. This also confirms that there has been trade diversion away from Côte d'Ivoire.

Figure 7. Estimated Lost Trade for Côte d'Ivoire and for the WAEMU due to Political Instability (in billions of US dollars)

Lost Trade for Côte d'Ivoire



Lost Trade for the WAEMU Region as a Whole



Source: IMF data and authors' calculations.

VIII. Conclusions and Policy Recommendations

The paper provides many insights into WAEMU trade. Intra-WAEMU trade, at 11 percent, is a relatively small share of total WAEMU trade, but Côte d'Ivoire is the main supplier. It is also the top WAEMU exporter to the rest of the world with more than 50 percent of total exports, making it the region's power house despite its political instability since 1999. This highlights the impact problems in Côte d'Ivoire can have on the trade and economic performance of the whole region.

We sought to analyze this impact by estimating a gravity model of WAEMU trade organized in a panel over the period 1990–2007. Preliminary testing showed that the whole panel data set could not fit a panel structure and could not be estimated using panel econometric techniques. We therefore conducted a multiple correspondence analysis of the data to elicit homogenous groups that could fit a panel data structure.

Once these groups were identified, we estimated the gravity model on them. The results generally were consistent with the model predictions: trade partner GDP was positively related to trade and negatively related to distance. However, the negative impact of distance on trade is stronger within the WAEMU than beyond, especially during the period of political instability in Côte d'Ivoire. This suggests that transaction costs in the region are higher than in the rest of world and that they increased during the period of political instability.

It is obvious that the instability in Côte d'Ivoire has been detrimental to trade in the entire region. This reflects both the increase in transaction costs and the lost opportunities owing to low growth in Côte d'Ivoire. Moreover, during the instability period a significant portion of Côte d'Ivoire's potential trade with the rest of the WAEMU was diverted to other WAEMU countries possessing a coastline. This diversification of trade routes may eventually turn out to be a good thing if it intensifies trade flows among WAEMU countries over time. Meanwhile, we estimate that instability cost Côte d'Ivoire close 40 percent of its potential trade flows with the rest of the WAEMU.

These results suggest that the sooner Côte d'Ivoire stabilizes the better, because instability weighs heavily on both its own and the region's trade and economic performances. Most observers agree that this exit will depend on open, fair, and democratic elections that would deliver a government most Ivorians would accept, effectively reunifying the country. More generally, the results show that political stability and security within the WAEMU is an important asset in promoting trade, integration, growth, and development. The region would therefore be well advised to put in place mechanisms to prevent such crises from occurring in one of its members.

The results also suggest that in order to reduce the costs of moving goods and people within the region, closer integration is necessary. This may happen through further harmonization of laws and practices, development of cross-border infrastructure, coordination to reduce racketeering on roads by armed forces that are supposed to provide security and law enforcement. It should not cost more to do business between neighbors who share the same culture, language, currency, and many other characteristics than it costs to trade with faraway countries. Since trade is so important for growth, perhaps the region can set up a mechanism for spotting and eliminating obstacles to trade. Similarly, further trade liberalization would encourage efforts to improve competitiveness and might eventually boost intra-WAEMU trade.

ANNEX 1

Description of Variables

The variables used by the model are:

- $(M+X)_{ijt}$: trade flows of country *i* with country *j* in year *t*
- GDP_{it} : real GDP of country *i* in year *t* (in US dollars)
- GDP_{jt} : real GDP of country *j* in year *t* (in US dollars)
- $gdpt_{it}$: real GDP per capita of country *i* in year *t* (in US dollars)
- $gdpt_{jt}$: real GDP per capita of country *j* in year *t* (in US dollars)
- $dist_{ij}$: distance between the business capitals of countries *i* and *j*
- $border_{ij}$: the dummy variable, which takes 1 if the countries share a borders and 0 if not
- $integration_{ij}$: a variable with three possible values: 1 for intra-WAEMU trade, 2 if one country belongs to the WAEMU and the other is Ghana or Guinea, and 3 if at least one of the countries does not belong to the WAEMU
- Coast: possession of a sea coastline.

Unit Root Tests

In this study we did not deem it necessary to test for the unit root on the variables because, whether there is cointegration or spurious regression, the usual estimators converge in probability toward the actual value of the parameter (Hurlin and Mignon, 2006).

ANNEX 2

Definition of Import Propensity

The propensity of country *i* to import from country *j* is defined as the sum of country *i* imports from country *j* divided by the GDP of country *i* in year *t*. For a given period the aggregate propensity of country *j* trading partners to import from it is defined as:

$$IP_j = \frac{\sum_{i}^{I}\sum_{t=1}^{T} M_{ijt}}{\sum_{i}^{I}\sum_{t=1}^{T} GDP_{it}}$$

where

M_{ijt} is the imports of country *i* from country *j* in year *t*

GDP_{it} is the GDP of country *i* in year *t*

Table A.1. Main Trade Partners of the WAEMU in Terms of Exports

Exporter	Trade Partners in WAEMU	Total WAEMU Trade
	(percent)	
BENIN		79.10
Niger	30.75	
Togo	23.96	
Ghana	13.59	
Côte d'Ivoire	10.89	
BURKINA FASO		98.90
Ghana	29.59	
Côte d'Ivoire	29.13	
Niger	18.74	
Togo	10.85	
Mali	10.59	
CÔTE D'IVOIRE		59.85
Mali	22.39	
Burkina Faso	20.64	
Ghana	16.82	
GUINEA-BISSAU		86.50
Guinea	24.50	
Côte d'Ivoire	62.03	
MALI		86.96
Côte d'Ivoire	31.96	
Guinea-Bissau	28.06	
Burkina Faso	26.94	
NIGER		81.90
Ghana	37.17	
Côte d'Ivoire	29.41	
Benin	15.31	
SÉNÉGAL		80.10
Mali	54.89	
Côte d'Ivoire	14.74	
Guinea	10.49	
TOGO		90.30
Ghana	32.52	
Burkina Faso	25.90	
Benin	21.72	
Mali	10.14	
GHANA		79.82
Benin	34.33	
Togo	30.99	
Côte d'Ivoire	14.50	
GUINEA		78.19
Côte d'Ivoire	78.19	

Sources: IMF data, 1990–2007, and authors' calculations.

Table A.2. Main Trade Partners of the WAEMU in Terms of Imports

Importer	Trade Partners in WAEMU	Total WAEMU Trade
	(percent)	
BENIN		95.70
Côte d'Ivoire	39.99	
Ghana	28.29	
Togo	15.59	
Senegal	11.79	
BURKINA FASO		84.94
Côte d'Ivoire	73.62	
Togo	14.32	
CÔTE D'IVOIRE		82.10
Ghana	18.04	
Guinea	14.37	
Senegal	49.69	
GUINEA-BISSAU		99.00
Senegal	83.75	
Côte d'Ivoire	15.25	
MALI		93.80
Côte d'Ivoire	60.36	
Senegal	33.44	
NIGER		70.10
Côte d'Ivoire	56.27	
Benin	13.80	
SÉNÉGAL		88.06
Côte d'Ivoire	88.06	
TOGO		80.30
Ghana	34.20	
Côte d'Ivoire	46.07	
GHANA		87.80
Côte d'Ivoire	68.95	
Togo	18.84	
GUINEA		98.10
Côte d'Ivoire	83.27	
Senegal	14.86	

Sources: IMF data and authors' calculations.

Table A.3. Propensity of Other WAEMU Countries to Import from Côte d'Ivoire, 1990–2007

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
	Per thousand (percent)																	
BEN	1.10	0.58	0.76	0.77	0.41	0.69	0.40	0.36	0.42	0.43	0.55	0.87	0.83	1.04	1.44	1.16	1.48	1.63
BFO	0.62	0.43	0.38	0.50	0.56	0.35	0.41	0.49	0.51	0.45	0.61	0.71	0.71	1.02	1.51	1.16	1.28	1.40
CIV	50.96	39.03	40.57	35.25	25.53	30.15	35.32	31.95	40.92	36.99	33.31	30.28	25.56	22.32	30.40	26.46	30.55	33.12
GBA	0.09	0.15	0.15	0.02	0.03	0.03	0.01	0.00	0.08	0.01	0.02	0.04	0.05	0.06	0.01	0.01	0.03	0.03
GHA	3.17	1.47	8.40	9.77	8.31	2.20	1.89	1.65	1.71	1.86	1.73	2.03	2.65	3.16	3.29	2.91	3.49	3.83
GUI	0.31	0.50	0.63	0.37	0.12	0.19	0.30	0.30	0.31	0.30	0.34	0.34	0.15	0.21	0.33	0.36	0.38	0.42
MLI	1.18	0.39	0.84	0.78	0.20	0.22	0.28	0.19	0.24	0.12	0.23	0.16	0.15	0.11	0.16	0.15	0.15	0.17
NER	0.42	0.53	0.09	0.06	0.27	0.33	0.43	0.27	0.33	0.24	0.21	0.16	0.31	0.41	0.33	0.36	0.39	0.43
SEN	9.07	5.27	7.88	5.25	4.58	5.11	5.15	4.24	4.16	4.18	3.58	4.09	5.99	8.05	8.17	10.63	9.88	10.90
TGO	2.93	1.18	1.61	0.83	0.79	0.47	0.71	0.67	0.67	2.17	1.62	3.81	4.02	6.05	5.85	5.33	5.89	6.47

Sources: IMF data, 1990–2007, and authors' calculations

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