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West African Monetary Integration and Interstates Risk-Sharing

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Abstract

There are continuing efforts at the monetary integration and unionization in West Africa. Several academics argue that a monetary union among West African states would be costly because of the magnitude of asymmetric shocks. A common monetary policy is inappropriate and ineffective to respond to divergent shocks. Therefore, the stability of such a union is critically dependent on risk-sharing mechanisms for achieving income insurance and consumption smoothing. A monetary union is still optimal if output stabilization mechanisms such as risk-sharing institutions, are in place to cope with asymmetric shocks. This article estimates risk-sharing channels among West African states from 1970 to 2004. It uses the definition of national accounts to measure the fraction of asymmetric output shocks smoothed via net factors income, net transfers and net saving. We find that compared to the OECD (Organization for Economic Cooperation and Development) estimates, the degree of risk-sharing among West African countries is quite low. We also obtain that net saving is the significant and stable risk-sharing channel. A further analysis shows that only the contribution of public saving is significant.

JEL codes: E2, E6, F3.

Keywords: Asymmetric shocks, Interstates Risk-sharing, West Africa.

1 Introduction

In 2000, the ECOWAS (Economic Community of Western African States) member states declared their intention to accelerate the economic integration of the region. They decided to create a second monetary zone, the WAMZ (West African Monetary Zone) in addition to the WAEMU (West African Economic and Monetary Union). At the final stage, the WAMZ and the WAEMU will merge so as to have a single currency for all ECOWAS states around 2020.[2] The monetary union arrangement is perceived by West African policymakers as a possible way to get sound macroeconomic policies and sustained economic growth for the entire region.

The suitability of a monetary union among West African states was discussed by several academics. A consensus has emerged suggesting that shocks affecting West African states are mostly country-specific shocks *i.e.* asymmetric. According to the theory of Optimal Currency Areas (OCA), the principal requirement for sharing a common currency is the symmetry of shocks (*i.e.* shocks affecting similarly countries)[3]. A common monetary policy and a common exchange rate policy are inappropriate and inefficient if shocks experienced by member states are different.

Opposite to this main stream, there are some contributions in the literature of monetary unions proposing that the symmetry of shocks is not the strict condition for sharing a common monetary policy and a common currency (*e.g.* Asdrubali *et al.,* 1996 and Sorensen and Yosha, 1998). When asymmetric shocks are important, the stability of monetary unions is critically dependent on mechanisms for achieving income insurance and consumption smoothing. Especially during recessions, countries may be provided with the incentive to leave the union if mechanisms for smoothing consumption are absent and supranational fiscal institutions cannot provide cross-country income insurance through tax-transfers or grant allocations to

[2] The prospect of a single currency for all West African states had been formalized in the ECOWAS treaty signed in 1975. The chapter IX of the treaty is entitled "Establishment and Completion of an Economic and Monetary Union".

[3] The theory of optimum currency areas (OCA) compares the costs and the benefits of entering or forming a common currency area. The OCA theory can be considered as a tool for answering the question on *"how to choose the optimum exchange rate regime?"*. The OCA theory outlines that the key requirement for suitable monetary unions is the symmetry of shocks, *i.e.*, shocks that affect countries similarly. The similarity of shocks offsets the costs induced by the delegation of the monetary policy and the exchange rate policy to a regional central bank, which has a regional objective rather than a country-specific target.

such governments in need. These conditions make the criterion for symmetric shocks less necessary for the formation and stability of a monetary union. Therefore, a monetary union could be optimal if output stabilization mechanisms such as risk-sharing institutions are in place to cope with asymmetric shocks. When risk-sharing mechanisms are perfect, domestic consumption only depends on aggregate resources, regardless of any asymmetric shock (Obstfeld, 1994).

This article sheds lights on the channels among West African states from 1970 to 2004. We use the definition of national accounts to measure the fraction of asymmetric output shocks smoothed via net factors income, net transfers and net saving. The contributions of net factors income, net saving and net transfers respectively indicate the degree of risk-sharing achieved through regional factors markets, through regional credit markets and regional fiscal transfer system. We find that compared to the OECD (Organization for Economic Cooperation and Development) estimates, the degree of risk-sharing among West African countries is quite low. We also obtain that net saving is the significant and stable risk-sharing channel. A further analysis shows that only the contribution of public saving is significant.

The rest of the article is organized as follows. The second section presents the background of the study. Section 3 describes the methodology of the decomposition of the cross-sectional variance of the GDP growth. Section 4 presents and discusses the empirical results. The last section concludes by providing some policies recommendations.

2 The background

2.1 West African monetary systems

The actual monetary systems in West Africa are the result of choices made immediately after the political independences (see Table 1). Most of the British colonies created their own currency whereas the French colonies established the West African Monetary Union (WAMU).

The WAMU comprises Benin, Burkina Faso, Guinea-Bissau, Côte d'Ivoire, Mali, Niger, Senegal and Togo. Togo joined the WAMU in 1963, Mali left in 1962 and rejoined in 1984, Mauritania left in 1973 and Guinea Bissau integrated the union in 1997. The members of the

WAMU also signed a pegging treaty with France that guarantees the unlimited convertibility of their currency. In compensation, the central bank of the union has to pool reserves at the union level - except sums which are necessary to their current treasury and those relating to their transactions with IMF - and has to deposit at least 50% of these reserves in an account (*compte d'opérations*), held by French treasury. In 1994 after the unique devaluation of the union, the member states expanded the monetary union agreement to an economic and monetary union, called WAEMU (West African Economic and Monetary Union).

Since 1975, the WAEMU member states created with seven others West African states (Cape Verde, Gambia, Ghana, Guinea Conakry, Liberia, Nigeria and Sierra Leone) the Economic Community of Western African States (ECOWAS). The ECOWAS envisions the promotion of the economic and political integration of West African states.

In 2000, ECOWAS countries decided to foster their monetary integration. The Accra summit launches the principles of a second monetary zone, the WAMZ (West African Monetary Zone) in addition to the WAEMU. The WAMZ groups Gambia, Ghana, Guinea Conakry, Nigeria and Sierra Leone. These countries have scheduled the introduction of a common currency in 2003. At the final stage, the WAMZ and the WAEMU will merge so as to have a single currency for all ECOWAS states. Due to difficulties to fulfil the convergence criteria, the introduction of the common currency in the zone was postponed several times (July 2005 and December 2009). The actual climate is the proposition of a new deadline for 2012.

Table 1: Actual West African monetary arrangements

	CFA Zone		
ECOWAS	**WAEMU:** Benin, Burkina Faso, Guinea-Bissau, Côte d'Ivoire, Mali, Niger, Senegal, Togo	**WAMZ:** Gambia, Ghana, Guinea Conakry, Nigeria and Sierra Leone	**Others:** Cape Verde, Liberia, Mauritania (left in 2000)

Note: ECOWAS sets for Economic Community of Western African States; WAEMU for West African Economic and Monetary Union, WAMZ for West African Monetary Zone.

2.2 Is there a suitable West African monetary union?

The suitability of a monetary union among West African states is not particularly strong. Countries in the region are differently specialized in one or two primary products. The specialization pattern hinges on the geography of countries. For instance, Sahelian economies (Burkina Faso, Mali and Niger) are essentially agricultural and submitted to frequent climatic shocks. Senegal, Ghana and Côte d'Ivoire have a more diversified and developed industrial structures. Benin and Togo form a third group where the import-export activity is predominant. Finally, Nigeria is totally different from the rest of ECOWAS by being largely dependent on crude oil exports. Because of differences in productions and exports, West African countries are subject to important asymmetric shocks.

Empirically, there is evidence that West African states do not have sufficient symmetry to meet this criterion (Fielding and Shields, 2001, Bénassy-Quéré and Coupet, 2005 and Tsangarides and Qureshi, 2006, Houssa, 2008). Fielding and Shields (2001) use the technique of structural vector auto-regressive (VAR) to analyze the correlation of output shocks and the correlation of price shocks within the CFA monetary unions. They find that price shocks are highly correlated whereas output shocks rarely co-moved. Houssa (2008) applies a dynamic structural factor model which solves some limits of the VAR methodology and finds similar conclusions for West African countries. Using cluster analyses, Bénassy-Quéré and Coupet (2005) and Tsangarides and Qureshi (2006) also find a significant lack of homogeneity among West African states. Overall, the assessment of the optimality of monetary union among West African countries is negative.

However, a monetary union is still optimal if member states are able to share output risks. This was the focus of Mundell in his seminal article "A Theory of Optimal Currency Areas" in 1961. In introducing the concept of OCA, Mundell discussed the role of labour mobility as a stabilization mechanism in monetary union. If a country is able to share output risks with its partners in a monetary union, this regime could solve other rigidities in the area. Risk-sharing mechanisms mitigate the negative effects of asymmetric shocks by smoothing domestic consumption. A risk-sharing arrangement allows financial transfers from booming economies towards partners in recession. For illustration, in a pooling group, a country experiencing a temporary commodity boom can lend the extra revenue to partners in recession through budgetary transfers or regional credit markets. When risk-sharing mechanisms are perfect,

domestic consumption only depends on aggregate resources, regardless of any asymmetric shock.

2.3 A brief literature review

The topic of risk-sharing was developed for industrial countries and has been ignored for Africa.

Asdrubali *et al.* (1996) was the first to introduce the methodology of the assessment of interstates risk-sharing. They show that find that in the case of the United States of America, financial markets play a much larger role than the federal government transfers as channels of interstate risk sharing. They obtain that 39% of shocks to GDP are smoothed by capital markets, 13% by transfers from the federal government and 23% by credit markets. The amount of interstate risk-sharing not smoothed is only 25% of shocks to gross domestic product. Sorensen and Yosha (1998) extend the methodology of Asdrubali *et al.* (1996) in order to analyze channels of risk sharing among OECD and EMU (European Monetary Union) countries. They find that, for OECD as well as for EMU countries, about 40 percent of shocks to GDP are smoothed, with about half the smoothing achieved through national government budget deficits and half by corporate saving. Finally, Marinheiro (2005) analyses the smoothing of asymmetric shocks to output for the euro area. He examines whether the private capital markets is able to replace the government in providing output smoothing in the euro-area. As Sorensen and Yosha (1998), he finds no evidence of large differences in the patterns of risk sharing for the OECD countries and euro-area countries.

The issue of risk-sharing has been marginalized in the literature for African countries. To the best of our knowledge, Yehoue (2005) is the unique article on risk-sharing among African states. He focuses on risk-sharing within the two monetary unions of the CFA zone and finds that the French aid and the contributions of the central banks play an important role in the stabilization of domestic consumptions. The aim of the present paper is to contribute to fill this gap in the literature. I analyze here the special case of West African states in the perspective of the future monetary union. I estimate the channels of risk-sharing among West African countries.

3 Methodology

The methodology applied in this study uses the definition of national accounts to decompose the cross-sectional variance of output growth. The decomposition allows the estimate of channels through which asymmetric shocks are pooled among a group of countries.

3.1 Risk-sharing channels

Risk-sharing mechanisms are formal or informal institutions that help consumption smoothing by allowing "payments" from booming economies towards recession countries. In national accounts, there are three major flows measuring such "payments": factor income, net transfers and net saving.

The first risk-sharing channel takes place on factor markets. Income earned from capital invested abroad or income earned by citizens working abroad may contribute to interstate risk-sharing. For example if capital is mobile, citizens could smooth their consumption by acquiring financial assets in partner countries. By the same token, in the context of labour mobility, residents in recession countries can temporary work in booming partners and smooth their consumption. In national accounts, net factor income is recorded as the sum of net capital income and net labour income. This corresponds to the discrepancy between Gross National Product (GNP) and GDP.

The second channel is a "tax-transfer" system through net transfers. Interstate transfers may participate in the stabilization of asymmetric shocks if they move from booming countries towards the recession economies. In national accounts, the gap between Disposable National Income (DNI) and GNP denotes net transfers.

The last channel is net saving. It represents the contribution of international credit markets in risk-sharing. Citizens, corporations and governments may adjust their savings in response to shocks affecting their incomes by accumulating during expansion periods and dis-saving during recession periods. This adjustment consequently copes with both symmetric and asymmetric shocks. Particularly, if asymmetric shocks are important, countries would

optimally choose to share risks and smooth their consumption via saving. For example a booming country can lend on international or regional credit markets its extra saving to a partner country in recession. In national accounts, net saving is the difference between DNI and domestic consumption.

The next subsection describes the decomposition of the cross-sectional variance of GDP growth. It estimates the risk-sharing channels above-mentioned.

3.2 Variance decomposition

The methodology of the decomposition of the cross-sectional variance of GDP growth was introduced by Asdrubali *et al.* (1996) and extended by Sorensen and Yosha (1998). It assumes that shocks to output are exogenous from risk-sharing processes. From output to consumption, the following chain equation can be defined:

$$GDP_t^i = \frac{GDP_t^i}{GNP_t^i} * \frac{GNP_t^i}{NI_t^i} * \frac{NI_t^i}{DNI_t^i} * \frac{DNI_t^i}{C_t^i} * C_t^i \qquad (1)$$

GDP denotes the Gross Domestic Product, GNP the Gross National Product, NI the National Income, DNI the Disposable National Income and C the total consumption. These aggregates are defined as follows:

GNP = GDP + Net factor income,

NI = GNP – Capital depreciation,

DNI = NI + Net transfers,

C = DNI – Net saving

At first glance, equation (1) provides insights into channels through which consumption is stabilized by smoothing out GDP shocks. After an exogenous GDP shock, stabilization is achieved through the adjustment of net factors income if GNP remains unchanged. By the same token, if GNP varies and NI remains constant after a shock, then stabilization of output shocks is achieved through the depreciation of capital. If NI varies and DNI remains constant

after a shock, then stabilization of output shocks is achieved through the adjustment of net transfers. Likewise, if DNI varies whereas consumption is constant, stabilization is obtained via the adjustment of net saving. Finally, shocks are not totally stabilized if total consumption fluctuates.

A decomposition of output growth can be obtained by taking the logarithms and the first-differences of equation (1):

$$\begin{aligned} \Delta LogGDP_t^i &= (\Delta LogGDP_t^i - \Delta LogGNP_t^i) + (\Delta LogGNP_t^i - \Delta LogNI_t^i) \\ &+ (\Delta LogNI_t^i - \Delta LogDNI_t^i) + (\Delta LogDNI_t^i - \Delta LogC_t^i) + \Delta LogC_t^i \end{aligned} \quad (2)$$

From equation (2), the variance of GDP growth is computed as follows:

$$\begin{aligned} V[\Delta LogGDP_t^i] &= E[(\Delta LogGDP_t^i)^2] - E[\Delta LogGDP_t^i]^2 \\ &= Cov[\Delta LogGDP_t^i, \Delta LogGDP_t^i - \Delta LogGNP_t^i] \\ &+ Cov[\Delta LogGDP_t^i, \Delta LogGNP_t^i - \Delta LogNI_t^i] \\ &+ Cov[\Delta LogGDP_t^i, \Delta LogNI_t^i - \Delta LogDNI_t^i] \\ &+ Cov[\Delta LogGDP_t^i, \Delta LogDNI_t^i - \Delta LogC_t^i] \\ &+ Cov[\Delta LogGDP_t^i, \Delta LogC_t^i] \end{aligned} \quad (3)$$

where Cov denotes the covariance defined by $Cov(X,Y) = E(X) * E(Y) - E(XY)$[4]. The division of both sides of equation (3) by the by the variance of GDP growth $V[\Delta LogGDP_t^i]$ leads to the following result:

[4] In order to compute the variance of output growth from equation (2), I need to compute the difference between $E[(\Delta LogGDP_t^i)^2]$ and $E[\Delta LogGDP_t^i]^2$. First, I multiply and factorize both sides of equation (2) by $\Delta LogGDP_t^i$ and after then I compute the mathematical expectation of the result. Second, I compute the mathematical expectation of equation (2) and multiply the outcome by $E[\Delta LogGDP_t^i]$.

$$
\begin{aligned}
1 &= \frac{Cov[\,\Delta LogGDP_t^i, \Delta LogGDP_t^i - \Delta LogGNP_t^i\,]}{V[\,\Delta LogGDP_t^i\,]} \\
&+ \frac{Cov[\,\Delta LogGDP_t^i, \Delta LogGNP_t^i - \Delta LogNI_t^i\,]}{V[\,\Delta LogGDP_t^i\,]} \\
&+ \frac{Cov[\,\Delta LogGDP_t^i, \Delta LogNI_t^i - \Delta LogDNI_t^i\,]}{V[\,\Delta LogGDP_t^i\,]} \\
&+ \frac{Cov[\,\Delta LogGDP_t^i, \Delta LogDNI_t^i - \Delta LogC_t^i\,]}{V[\,\Delta LogGDP_t^i\,]} \\
&+ \frac{Cov[\,\Delta LogGDP_t^i, \Delta LogC_t^i\,]}{V[\,\Delta LogGDP_t^i\,]}
\end{aligned} \qquad (4)
$$

And under the subsequent notations:

$$
\begin{aligned}
\beta_f &= \frac{Cov[\,\Delta LogGDP_t^i, \Delta LogGDP_t^i - \Delta LogGNP_t^i\,]}{V[\,\Delta LogGDP_t^i\,]} \\
\beta_d &= \frac{Cov[\,\Delta LogGDP_t^i, \Delta LogGNP_t^i - \Delta LogNI_t^i\,]}{V[\,\Delta LogGDP_t^i\,]} \\
\beta_\tau &= \frac{Cov[\,\Delta LogGDP_t^i, \Delta LogNI_t^i - \Delta LogDNI_t^i\,]}{V[\,\Delta LogGDP_t^i\,]} \\
\beta_s &= \frac{Cov[\,\Delta LogGDP_t^i, \Delta LogDNI_t^i - \Delta LogC_t^i\,]}{V[\,\Delta LogGDP_t^i\,]} \\
\beta_u &= \frac{Cov[\,\Delta LogGDP_t^i, \Delta LogC_t^i\,]}{V[\,\Delta LogGDP_t^i\,]}
\end{aligned}
$$

Equation (4) is equivalent to $1 = \beta_f + \beta_d + \beta_\tau + \beta_s + \beta_u$. β_f is the slope of the Ordinary Least Squares (OLS) regression of $(\Delta LogGDP_t^i - \Delta LogGNP_t^i)$ on $\Delta LogGDP_t^i$. β_d corresponds to the OLS regression of $(\Delta LogGNP_t^i - \Delta LogNI_t^i)$ on $\Delta LogGDP_t^i$, β_τ to the OLS regression of $(\Delta LogNI_t^i - \Delta LogDNI_t^i)$ on $\Delta LogGDP_t^i$, β_s to the OLS regression of $(\Delta LogDNI_t^i - \Delta LogC_t^i)$ on $\Delta LogGDP_t^i$ and β_u to the regression of $\Delta LogC_t^i$ on $\Delta LogGDP_t^i$ (the β slope of the OLS regression of variables Y on X is defined as $\beta = \frac{Cov(X,Y)}{V(X)}$). The β-coefficients are, in that case, interpreted as measures of incremental percentages of GDP shocks stabilized at each level of the decomposition aforementioned. Thereby the coefficients β_f, β_d, β_τ, β_s respectively denote the incremental percentage of output shocks compensated by net factors income, capital depreciation, net transfers and net saving. In principle, the β-coefficients could be either positive or negative. A positive coefficient would indicate a stabilization channel whereas a negative one would imply a destabilization channel.

It is possible to calculate the β-coefficients for each country and each year. However, in the present work we are interested in average coefficients for a group of country during a given period and in the response to asymmetric. Therefore, the β-coefficients are estimated through a panel system by including year-specific dummies. The year-specific dummies capture the aggregate component in GDP growth rates (*i.e.,* the symmetric shocks) and allows the interpretation of the β-coefficients as the incremental percentages of asymmetric shocks stabilized at each level of the decomposition aforementioned. Thereby β_f, β_τ, β_s are the incremental percentage of asymmetric shocks respectively stabilized through net factors income, net transfers and net saving.

$$\begin{aligned}
\Delta LogGDP_t^i - \Delta LogGNP_t^i &= v_{f,t} + \beta_f * \Delta LogGDP_t^i + e_{f,t}^i \\
\Delta LogGNP_t^i - \Delta LogNI_t^i &= v_{d,t} + \beta_d * \Delta LogGDP_t^i + e_{\tau,t}^i \\
\Delta LogNI_t^i - \Delta LogDNI_t^i &= v_{\tau,t} + \beta_\tau * \Delta LogGDP_t^i + e_{\tau,t}^i \\
\Delta LogDNI_t^i - \Delta LogC_t^i &= v_{s,t} + \beta_s * \Delta LogGDP_t^i + e_{s,t}^i \\
\Delta LogC_t^i &= v_{u,t} + \beta_u * \Delta LogGDP_t^i + e_{u,t}^i
\end{aligned} \qquad (5)$$

The $v_{.,t}$ are year-specific dummies and the $e_{.,t}^i$ denote the error terms. Intuitively, if a country experiences an exogenous drop in its GDP by 5% whereas its GNP falls only by 3%, then net factor income contribute to stabilize 40% of shocks. Therefore the corresponding coefficient β_f estimated in the system (5) is 0.4. The coefficient β_u gives the proportion of shocks that are not stabilized.

The system (5) is estimated with the method of Generalized Least Squares (GLS) in two-steps. The first step uses the clustering technique to correct the heteroskedasticity. It also uses the procedure of Cochrane-Orcutt to correct the potential autocorrelation in the residuals. In doing so, we assume for each country that the error terms follow an AR (1) process. The second step applies the OLS estimates. The OLS estimates are in this case equivalent to the Seemingly Unrelated Regression (SUR) technique because all equations in the system have the same covariate. Finally, we do not constraint the β-coefficients. Therefore, the coefficients could be larger than 1 or negative.

The methodology of variance decomposition was criticized in the literature (*e.g.* Mélitz and Zùmer 1999, Bayoumi 1999). The methodology assumes that the GDP shocks are exogenous vis-à-vis the risk-sharing processes. If this statement does not hold, there is a simultaneity bias

and the OLS estimate of structural coefficients of the system (5) is not robust. Mélitz and Zùmer 1999 use the technique of instrumental variables on the Asdrubali *et al.*'s (1996) dataset and conclude that results do not significantly change. Furthermore, the methodology of variance decomposition does not address the issue of differences in countries sizes. It is difficult for small countries in expansion to compensate large countries in recession. In this context, a risk-sharing arrangement is unsustainable. The correction of heteroskedasticity and the use of per capita data reduce this problem in estimates. Nonetheless these drawbacks the advantage of the methodology variance decomposition is the joint examination of the respective contribution of factors markets, net transfers and credit markets in interstate risk-sharing.

We collect from the *World Development Indicators 2006*, annual data on GDP, GNP, domestic consumption (C), gross national saving (S) and capital consumption as a percentage of GNP. We also use from the *World Bank African Database 2005*, annual data on gross national private saving and gross national public saving. All data are expressed in real terms *i.e.* in 2000 US dollars. When the real value is unavailable, we use the GDP in constant local currencies, the GDP in current U.S. Dollars and the GDP in constant U.S. Dollars as conversion factors. Data are also measured data in per capita terms. When the per capita term is unavailable, we divide it by the midyear population. The dataset covers the fifteen West African states from 1970 to 2004. Because of the lack of data, the dataset is an unbalanced panel dataset[5]. The correction of heteroskedasticity by country accounts for this limit.

4 Empirical analysis

4.1 Results

We estimate the panel system (5) for West African countries. Results are reported in Table 2. The coefficients and the standard errors are multiplied by 100 and rounded so as we are able to compare our estimates to the related literature. We find that risk-sharing achieved among West African states is low. In Table 2, the proportions of unsmoothed asymmetric shocks are

[5] Countries in the sample are Benin (1970-2004), Burkina Faso (1970-2004), Cape Verde (1986-2004), Côte d'Ivoire (1970-2004), Gambia (1970-2004), Ghana (1970-2004), Guinea Conakry (1986-2004), Guinea Bissau (1970-2004), Liberia (1970-2004), Mali (1970-2004), Mauritania (1970-2004), Niger (1970-2004), Nigeria (1970-2004), Senegal (1970-2004), Sierra Leone (1970-2004), Togo (1970-2004).

about 76% within the ECOWAS and the WAEMU. Surprising the estimate is better among WAMZ countries. They only fail to share about 67% of asymmetric shocks. The estimated coefficients are robust at 1%. Our results also suggest that risk-sharing through net factor income, capital depreciation and net transfers are absent. Net factor income tends to destabilize output in the ECOWAS and the WAMZ economies. Similarly, capital depreciation is not a smoothing channel of asymmetric shocks with the three zones analyzed. Exceptionally, net transfers help to significantly absorb about 29% of asymmetric shocks. Most important, the significant and stable risk-sharing channel among West African is net saving. It contributes to cope with 21% of asymmetric shocks within the three zone of interest. This represents around 90% (21/76) of smoothed shocks within ECOWAS and WAEMU and 70% (21/70) within the WAMZ.

Table 2: Risk-sharing channels against asymmetric shocks in West Africa (1970-2004)

	[1]	[2]	[3]
	ECOWAS	WAEMU	WAMZ
Net factor income	-2	0	-2
	(2)	(1)	(4)
Capital depreciation	0	1	-1
	(1)	(1)	(3)
Net transfers	5	-1	29*
	(6)	(7)	(17)
Saving	21***	21***	21*
	(5)	(6)	(13)
Unsmoothed	76***	76***	67***
	(6)	(6.86)	(17)
F test on year dummies	Significant	Significant	Significant
Observations	472	224	149

Notes: Two-steps GLS estimates based on system (5). Robust standards errors in parentheses. The coefficients and the standard errors are multiplied by 100 and rounded. * significant at 10%; ** significant at 5%; *** significant at 1%.

These finding can be extended to all types of fluctuations both asymmetric and symmetric shocks. Results remain unchanged when the system (5) is estimated without year dummies. In Table 3 the fractions of unsmoothed shocks are still important (between 68 and 80% of

shocks) and net saving is still the significant smoothing channel (between 21% and 32% of shocks). The contributions of net factor income, capital depreciation and net transfers are not statistically robust.

Table 3: Output stabilization channels against all shocks in West Africa (1970-2004)

	[1]	[2]	[3]
	ECOWAS	WAEMU	WAMZ
Net factor income	-2	-1	-1
	(2)	(1)	(4)
Capital depreciation	0	0	-1
	(1)	(1)	(3)
Net transfers	0	-1	11
	(6)	(6)	(15)
Saving	22***	21***	32***
	(5)	(6)	(11)
Unsmoothed	81***	79***	69***
	(6)	(6)	(14)
Observations	472	224	149

Notes: Two-steps GLS estimates based on system (5). Robust standards errors in parentheses. The coefficients and the standard errors are multiplied by 100 and rounded. * significant at 10%; ** significant at 5%; *** significant at 1%.

Because our estimates clearly indicate that it is the key risk-sharing channel, we analyze in depth the contribution of net saving. From an income perspective, net saving is the sum of public saving and private saving. The regulation of private saving and public saving are different. Actions and rules on financial markets are effective for private saving whereas fiscal rules are necessary for public saving. The comparison of the respective contributions of private and public saving would then prioritize policy actions.

From the fourth equation of the system (5), the contributions of the public saving and the private saving in risk-sharing are estimated through the following equations:

$$\Delta LogDNI_t^i - \Delta Log(DNI_t^i - Sg_t^i) = v_{g,t} + \beta_s^g * LogGDP_t^i + e_{g,t}^i \quad (6a)$$

$$\Delta LogDNI_t^i - \Delta Log(DNI_t^i - Sp_t^i) = v_{p,t} + \beta_s^p * LogGDP_t^i + e_{p,t}^i \quad (6b)$$

Sg_t^i and Sp_t^i respectively denotes public saving and private saving. $v_{g,t}$ and $v_{p,t}$ are time fixed effects and catch the effect of aggregate shocks.[6] Because of the control of aggregate shocks, the coefficient β_s^g and β_s^p are interpreted as the proportions of asymmetric shocks smoothed through public saving and private saving. We estimate equations (6a) and (6b) with the Generalized Least Squares (GLS) in two-steps described above. Estimates are presented in Table 4. The channel of public net saving is significant. It helps to cope with 12% of asymmetric shocks within the ECOWAS and 20% with the WAEMU. Contrasting, the contribution of private net saving is not statistically significant within the two zones. Estimates for WAMZ countries are not relevant because of the lack of data.

Table 4: Risk-sharing channels in West Africa: public saving and private saving (1970-2004)

	ECOWAS	WAEMU	WAMZ
Public saving	12**	20***	-2
	(5)	(5)	(2)
Private saving	1	-3	9
	(6)	(6)	(6)
F test on year dummies	Significant	Significant	Significant
Observations	226	127	43

Notes: Two-steps GLS estimates based equations (6a) and (6b). Robust standards errors in parentheses. The coefficients and the standard errors are multiplied by 100 and rounded. * significant at 10%; ** significant at 5%; *** significant at 1%.

In summary, risk-sharing among West African states is quite low. The small smoothing observed is achieved via the channel of net saving and mainly through the adjustment of public net saving.

[6] A similar decomposition is proposed by Marinheiro (2005, p. 201) for public and private saving of OECD countries, and by Sorensen and Yosha (1998, p. 234).

4.2 Discussion

In this section, we discuss the relevance of West African risk-sharing estimated. We compare our estimates to the literature on industrial countries, discuss the reality of West African results and provide explanations of the contribution of public sector in risk-sharing.

First, we benchmark the significance of baseline estimates in the related literature in Table 5. For the sake of brevity, we compare our results to the Sorensen and Yosha's (1998) and Marinheiro's (2005) findings on the OECD countries (see Sorensen and Yosha, 1998, Table 1, Column 4, p. 226 and Marinheiro, 2005, Table 2, Column 1, p. 199). The proportion of asymmetric shocks that are unsmoothed among West African states (76%) is relatively high. Sorensen and Yosha (1998) and Marinheiro (2005) estimate smaller fractions for OECD states: between 59% (period 1981-90) and 65% (period 1970-99). These authors also find that net saving. Its contribution is much sizeable among OECD states: between 40% (period 1981-90) and 50% (period 1970-99). Finally, similar to our estimates, net factors income and net transfers are not significant smoothing channels among OECD states. We then conclude that risk-sharing patterns are not different from those observed among industrial countries. Only the degree and the contribution of net saving are different.

Second, our estimates of risk-sharing among West African countries are consistent with the realities of economies. First, the low contribution of net factor income is due the lack of labour and capital mobility in West Africa. Adjustment through factor mobility is limited by an important inequality in economic sizes and development between countries. Although important, migration flows are mainly from small and poor states toward rich countries and often create ethnic tensions in recipient countries. On institutional grounds, the ECOWAS countries introduce in 2000 a community passport so as to ease mobility of citizens. The point c of the article 4 in the WAEMU treaty foresees the free mobility of people, capital and liberal professionals. Second, interstate transfers are absent or inappropriate in the region. For instance, the interstate fund created by the WAEMU members in February 1998 was designed for structural issues such as regional disparities instead of coping with temporary shocks (Guillaumont Jeanneney, 2004). It mainly finances investments in regional infrastructures. In the WAMZ project, it is scheduled to launch a stabilization fund to allow members to face balance of payments shocks (Asante and Masson 2001). And finally, the relative low degree of risk-sharing achieved via net saving among West African states corroborates the illiquidity

and the weakness of financial integration in the region. For instance there are no more than three stock markets in the region: WAEMU stock exchange (Bourse Régionale des Valeurs Mobilières), Ghana stock exchange and Nigeria stock exchange.

Third, the difference between the contributions of private sector and public sector is related to a wider factor specific to African countries. Private sectors in these countries have difficulties to obtain formal credit on domestic, regional or international markets. Moral hazard, repudiation risk and the lack of collaterals reduce the likelihood for citizens and corporations to obtain a formal bank credit (*e.g.* Christensen, 2004 and Sacerdoti, 2005). Conversely, fiscal authorities have more facility to benefit from domestic or international credits in the case of negative asymmetric shocks or to lend its surplus on domestic or international credit markets after a positive asymmetric shock.

Table 5: Benchmark with literature		
	Sorensen and Yosha (1998) (a)	Marinheiro (2005) (b)
	OECD 1981-1990	OECD 1970-1999
	Table 1, column 4 (p. 226)	Table 2, column 1 (p. 199)
	[1]	[3]
Net factor income	-2**	-2
	(1)	(1)
Capital depreciation	-9***	-7***
	(2)	(7)
Net transfers	3***	-1
	(1)	(1)
Saving	44***	50***
	(4)	(15)
Unsmoothed	65***	59***
	(4)	(20)
Notes: Two-steps GLS estimates based on system (5). Year dummies are included. Robust standards errors in parentheses. The coefficients and the standard errors are multiplied by 100 and rounded. * significant at 10%; ** significant at 5%; *** significant at 1%.		

5 Conclusion

Achieving a monetary union is an official goal of the ECOWAS treaty. In 2000, the leaders of the region declared their intention to work for a second monetary zone (WAMZ) that will merge with the actual monetary union WAEMU. Several authors have shown that the principal requirement for sharing common currency and common monetary policy (*i.e.* the symmetry of shocks) is not particularly strong among West African states. Sharing a common monetary policy would be inefficient and costly for West African states. However, their approach is limited since a monetary union could be optimal if output stabilization arrangements such as risk-sharing institutions are in place to cope with asymmetric shocks. Risk-sharing mechanisms aim at the smoothing of domestic consumption by allowing "payments" from booming economies towards partners in recession. In this article, we analyze risk-sharing channels among West African states. We use the definition of national accounts to decompose the cross-sectional variance of GDP growth. We are able to estimate the fraction of output growth smoothed through net factors income (factors market), net transfers (tax-transfer system) and net saving (credit market).

Our analyses indicate that compared to OECD countries the degree of risk-sharing achieved among West African states is quite low. The significant and stable risk-sharing channel is net saving. A detailed investigation shows that smoothing via net saving is a public sector contribution. These findings suggest that a monetary union among West African states would be less costly if countries first develop regional credit markets or facilitate access to international credit market. Since public saving has an important contribution in interstate output stabilization, national fiscal authorities might support this agenda by being important actors on regional credits markets. For example, governments can issue short-term bonds on regional credit markets in the event of negative asymmetric shocks or acquire financial assets when the shocks are positive. They could also create incentives to access to international credit markets. Further, West African must care about factors mobility and the design of compensation funds so as to alleviate the negative effects of asymmetric shocks and reinforce the contribution of regional credit markets.

The conclusion of this article is as follows. Future West African monetary union can partly stabilize asymmetric shocks by developing regional credit with an active participation of national fiscal authorities.

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