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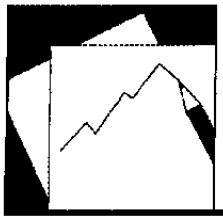

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Monetary Union in West Africa: Who Might Gain, Who Might Lose, and Why?

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Monetary Union in West Africa: Who Might Gain, Who Might Lose, and Why?[1]

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Abstract

We develop a multicountry model in which governments aim at excessive spending in order to serve the narrow interests of the group in power. This puts pressure on the monetary authorities to extract seigniorage, and thus affects the incentives countries would have to participate in a monetary union. This feature, ignored by the monetary union literature for Europe, is potentially important in Africa. We calibrate the model to data for West Africa and use it to assess proposed ECOWAS monetary unions. We conclude that monetary union with Nigeria would not be in the interests of other ECOWAS countries, unless it were accompanied by effective discipline over Nigeria's fiscal policies.

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I. INTRODUCTION

The elimination of national currencies and their replacement by a common regional currency continues to be a topical subject. It has inspired much research, mainly in the European context, but other regions are now considering the advisability of such a project. The reasons for doing so range from wanting to promote regional solidarity and integration to a fear that independent national currencies may be subject to destabilizing speculation. One example is a project to create by 2004 a common currency among 13 countries of West Africa. This project has the particularity that the region already includes a monetary union, the West African Economic and Monetary Union (WAEMU),[3] and a number of countries that are not members of it propose to create a second monetary zone (the West African Monetary Zone, or WAMZ) in 2003, with the intention of subsequently merging it with WAEMU.[4]

In this paper,[5] we analyze the main costs and benefits of the proposed monetary unions in West Africa using a simple theoretical framework calibrated to reflect some of the region's key economic and political features. The analysis encompasses traditional "Optimum Currency Area" (OCA) arguments as well as the role of commitment problems in macroeconomic policy, placing a special emphasis on the distortions generated by politically motivated decision makers. More specifically, we assume that governments in power tend to spend more than society as a whole would want because they channel resources toward their supporters. Such a distortion affects monetary policy through the incentive to extract seigniorage. If the decision-making of the central bank reflects the preferences of member governments, then differences in fiscal distortions among countries affect incentives for a country to join a monetary union, and for an existing member, the willingness to accept new members. This factor is arguably of considerably greater importance in Africa than in Europe, and we present some evidence below on the extent of fiscal distortions.

We consider only the direct effect of monetary unification, not the possible use of supranational institutions to establish anti-inflationary credibility, for instance through an external guarantee of a peg to a hard currency. In the model, net gains or losses from joining a monetary union depend on the extent of correlation of shocks to the terms of trade (TOT)

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[3] WAEMU, which is part of the CFA franc zone, has 8 members, namely Benin, Burkina Faso, Côte d'Ivoire, Guinea-Bissau, Mali, Niger, Senegal, and Togo.

[4] These countries are among the 15 countries forming the Economic Community of West African States (ECOWAS). The 5 countries participating in the WAMZ project currently have their own independent currencies: The Gambia, Ghana, Guinea, Nigeria, and Sierra Leone. In addition to these 5 and the 8 WAEMU countries, ECOWAS has two other members: Liberia, which has so far declined to participate in the project, and Cape Verde, whose currency is linked to the euro.

[5] It draws on a theoretical model presented in Debrun, Masson, and Pattillo (2002), henceforth abbreviated as DMP (2002).

of members of the union, the extent to which countries have a political distortion toward overspending, and the strength of the trade linkages between them. We calibrate the model to data for West African countries, and examine the desirability of forming a monetary union, either among all the ECOWAS countries,[6] or among a subset of them. Since the parameters are not precisely pinned down, a sensitivity analysis is undertaken in order to see if the results about the feasibility of monetary unions are robust in the face of plausible variations of the parameters.

It needs to be recognized, of course, that there may be other incentives to join a monetary union, such as the desire for fuller regional integration. In addition, the peg of the CFA franc to the euro, and the guarantee of convertibility provided by the French treasury, gives an extra element of stability to the existing WAEMU zone. We do not attempt to model this in the present paper, but we discuss below how incentives to make a wider monetary union might affect its stability.

The second section of the paper summarizes the theoretical model while the relevant stylized facts concerning West African economies are presented in Section III. Section IV describes the calibration of the model. The simulation results are presented and discussed in Section V. Section VI concludes.

II. Summary of the Model

This section summarizes the key features of the theoretical model supporting the simulations.[7] We keep the model as simple as possible and rely on the mainstream literature on European monetary integration, in particular Beetsma and Bovenberg (1998, 1999) and Martin (1995). The interest of that strand of literature for our exercise is twofold. First, it emphasizes the role of commitment problems in macroeconomic policy, an aspect that is particularly relevant in Africa, where credible institutional fixes (i.e., central bank independence and fiscal rules) are harder to implement than in other regions. Second, it is based on straightforward extensions of the highly flexible Barro-Gordon (1983) framework, which allows for neat analytical solutions while addressing at the same time the interaction between monetary and fiscal policies and international policy coordination. This approach is well suited to shed light on regional efforts to build a multilateral monetary union similar to the one envisaged in Western Africa. The present multilateral focus sharply contrasts with

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[6] Guinea-Bissau and Liberia are not considered because of data availability problems, and because the former has only been a member of WAEMU since 1997 and the latter is not a participant in the WAMZ project. Cape Verde is not considered either, since it is not a participant in WAMZ and its interest in the wider ECOWAS currency union is unclear.

[7] See DMP (2002) for derivations as well as systematic comparisons with the relevant literature. For a survey of the recent literature on monetary and fiscal policies in a currency union, see Beetsma and Debrun (2002).

the treatment of currency unions recently proposed by Alesina and Barro (2002) who view monetary integration as a process of dollarization in which inflation-prone countries adopt "hard" currencies in a *bilateral* "client-anchor" relationship. Another key difference is that Alesina and Barro (2002) emphasize the induced increase in bilateral trade among the members of a currency union, a dimension that is admittedly less relevant in the African context (see Section III).

We consider a static, n-good, n-country economic area, which is assumed to be small vis-à-vis the rest of the world. Countries differ only by the size of their GDP, the propensity of their governments to spend public resources on socially wasteful projects, and the shocks affecting output. We use log-linear specifications where each variable represents a relative deviation from an arbitrary steady state. Variables or parameters indexed by the subscript i are country-specific, the other variables or parameters being identical across countries. All parameters are positive.

As in the related literature, a Lucas-type supply function determines output (y) so that *unexpected* inflation ($\pi_i - \pi_i^e$) affects activity. Following Alesina and Tabellini (1987), an ad valorem tax of τ percent on firms' total revenue reduces output below its "natural" level (standardized to zero). Among interdependent economies, individual policies also influence neighboring countries, creating a policy coordination problem (Hamada, 1985). To focus on the key difference between autonomy and participation in a monetary union, we restrict the coordination problem to monetary policy[8] and assume that a monetary expansion in a given country has a contractionary impact on all other countries in the region. This assumption usually reflects a competitive-devaluation argument implying that noncoordinated monetary policies entail excessive inflation because of fruitless attempts to stimulate domestic output at the neighbor's expense (Hamada (1985); Canzoneri and Gray (1985); or Canzoneri and Henderson (1991)). Martin (1995) provides another rationale for negative externalities, claiming that investors prefer to locate in countries that manage to stay competitive by means of low real wages achieved through loose monetary policies. This argument implies the direct supply-side externality adopted in equation (1) below.[9] More generally, the latter can also be

[8] For recent discussions of fiscal coordination problems in monetary unions, see for instance Beetsma, Debrun and Klassen (2001), Andersen (2002) or Uhlig (2002) and the references therein.

[9] Martin (1995) provides micro-foundations for equation (1). However, it should be noted that "new open economy" multicountry models tend to emphasize the terms of trade as the international transmission channel of monetary policy. In that context, a domestic monetary expansion worsens the terms of trade, creating a positive spillover for the neighboring countries (see e.g., Clarida, Galì and Gertler, 2002 and the references therein). In reality, such effects should only materialize for "large" countries in the trade-theoretic sense and can be deemed negligible in an analysis that essentially concerns a group of small economies whose policy choices hardly influence their terms of trade.

interpreted as a convenient reduced-form equation. The externality is captured by parameters $\theta_{i,k}$ representing the marginal effect of a monetary policy action in country k on output in country i. These parameters are related to the relative importance of bilateral trade linkages and their determinants, such as relative sizes, geographic proximity, degree of economic integration, etc. Finally, we assume that output is subject to a well-behaved country-specific shock ε_i (zero-mean, non-autocorrelated and with finite variance $\sigma^2_{\varepsilon_i}$).

$$y_i = c\left(\pi_i - \pi_i^e - \tau_i\right) - \sum_{k \neq i, k=1}^{n} \theta_{i,k} c\left(\pi_k - \pi_k^e\right) + \varepsilon_i \ , \ i = 1,\ldots,n \tag{1}$$

Following Alesina and Tabellini (1987) and most of the subsequent literature, we impose a one-period budget constraint approximated by equation (2).

$$g_i = \mu\pi_i + \tau_i \tag{2}$$

where g_i and τ_i are the ratios of government spending and fiscal revenues to GDP and μ is the inflation tax base.

Policymakers maximize standard quasi-linear[10] utility functions generalizing Barro and Gordon (1983).

$$U_i^G = \frac{1}{2}\left\{ -a\left(\pi_i - \tilde{\pi}(\varepsilon_i)\right)^2 - b\tau_i^2 - \gamma\left(g_i - \tilde{g}_{G,i}\right)^2 \right\} + y_i \tag{3}$$

Equation (3) implies that the marginal benefit (cost) of output gain (loss) is constant whereas deviations of inflation, taxes, and expenditure from "ideal" levels (denoted by a tilde) are increasingly costly. Since that specification precludes output stabilization policies, we restore an implicit trade-off between the variability of inflation and the variability of output by making the socially desirable inflation rate contingent on supply shocks as follows: $\tilde{\pi}(\varepsilon_i) = -\eta\varepsilon_i$ with $\eta > 0$, as in Muscatelli (1998). A negative (positive) output shock thus incites the policymaker to tolerate positive (negative) inflation. Finally, we assume that policymakers manipulate fiscal policy to serve their own private objectives. To preserve analytical tractability, that political distortion simply consists of a wedge between the true socially optimal level of public expenditure—denoted by $\tilde{g}_{S,i}$—and the level targeted by the government. Assuming that a politically motivated government diverts a fraction of public expenditure to the exclusive benefit of cronies, it will have a distorted perception of the socially desirable level of expenditure and aim at suboptimally high levels: $\tilde{g}_{G,i} > \tilde{g}_{S,i}$.

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[10] See also Alesina, Angeloni and Etro (2001) or Muscatelli (1998) although micro founded open economy models rather validate quadratic functions (Woodford, 1999; Clarida et al. 2002).

The "true" social utility function is thus identical to equation (3) except the public expenditure target, which should be $\tilde{g}_{S,i}$ instead of $\tilde{g}_{G,i}$.

With autonomous monetary policies, policymakers independently choose effective tax rates τ_i and inflation rates π_i maximizing (3). This implicitly supposes flexible exchange rates. The optimal, time-consistent policy mix is derived under standard assumptions, that is, complete information, rational expectations and the following sequence of events: (*i*) binding nominal wage contracts are signed, (*ii*) shocks are realized and perfectly observed by all, and (*iii*) monetary and fiscal policies are decided. Under monetary autonomy, the time-consistent policy mix (denoted by a star superscript) for any country *i* can be characterized as follows:

$$\pi_i^* = \frac{\gamma\mu b}{\Lambda}\tilde{g}_{G,i} + \frac{\gamma(1+\mu)+b}{\Lambda}c - \frac{\eta a(b+\gamma)}{\Lambda}\varepsilon_i \tag{4}$$

$$\tau_i^* = \frac{\gamma a}{\Lambda}\tilde{g}_{G,i} - \frac{\gamma\mu(1+\mu)+a}{\Lambda}c + \frac{\eta\gamma\mu a}{\Lambda}\varepsilon_i \tag{5}$$

$$g_i^* = \frac{\gamma(a+\mu^2 b)}{\Lambda}\tilde{g}_{G,i} + \frac{b\mu - a}{\Lambda}c - \frac{\eta b\mu a}{\Lambda}\varepsilon_i \tag{6}$$

$$\text{with } \Lambda = a(b+\gamma)+\gamma\mu^2 b > 0$$

Equations (4) to (6) reflect optimal trade-offs between the objectives of the policymaker as well as the consequences of the familiar Barro-Gordon inflation bias (see DMP, 2002). Key features of the equilibrium are the following. First, *average* expenditure falls short of the target because both sources of revenue (taxation and inflation) are perceived as costly, either directly (see equation (3)) or through their impact on output. Second, distortionary taxes are positive but fail to fully finance public spending so that average inflation must also be positive to close the financing gap. The trade-off between the need to finance expenditure and the utility cost of inflation shows up in equation (4), through the term in $\tilde{g}_{G,i}$. In the same equation, the term in c captures two elements: an additional incentive to extract revenue from the inflation tax due to the output loss stemming from distortionary taxation and the Barro-Gordon inflation bias. The latter distorts the ex ante optimal outcome that would prevail if the policymakers were able to make credible commitments on inflation. With respect to that case, the inflation bias relaxes the budget constraint, allowing higher spending and lower taxes which in turn lead to greater output. In other words, the distortion resulting from the lack of commitment is a shift in the burden of financing expenditure from taxation to inflation.[11]

[11] See also Alesina and Tabellini (1987).

In a monetary union (MU), monetary policy is decided by a common central bank (CCB) whose actions maximize a weighted average of individual policymakers' utility functions—see equation (7).

$$U^{CCB} = \sum_{i=1}^{n} \omega_i U_i^G \tag{7}$$

$$\text{with } \omega_i > 0, \forall i \text{ and } \sum_{i=1}^{n} \omega_i = 1$$

It is crucial at this stage to note that we seek to isolate the "pure" effect of monetary unification on policy outcomes. Therefore, we refrain from considering the delegation of national monetary power to a supranational central bank as an external fix to domestic institutional weaknesses and assume that the CCB is subject to the same type of political pressures as a national central bank would be. The only difference is that, in a monetary union, individual pressures are diluted according to the relative weight of the country in the joint decision process.

The time consistent policy mix is described by the equations (8) to (10), where a subscript MU stands for monetary union and a subscript A designates cross-country, ω-weighted averages. For simplicity of exposition, we only reproduce here the solution for a monetary union among the n countries. Moreover, to ease comparisons with the case of autonomy, it is useful to define $\Psi_i \equiv \tilde{g}_{G,A} / \tilde{g}_{G,i}$. That parameter captures the discrepancy between country i's spending objective and the aggregate spending objective considered by the CCB. Any value different from 1 indicates that, from the perspective of country i the common monetary policy fails to achieve the optimal trade-off between tax and monetary financing.

$$\pi^*_{MU} = \frac{\gamma\mu b}{\Lambda}\tilde{g}_{G,A} + \frac{\gamma(1+\mu)+b-\theta_A(b+\gamma)}{\Lambda}c - \frac{\eta\alpha(b+\gamma)}{\Lambda}\varepsilon_A, \tag{8}$$

$$\tau^*_{i,MU} = \left[\frac{a\gamma}{\Lambda} + \frac{\gamma^2\mu^2 b[1-\Psi_i]}{(b+\gamma)\Lambda}\right]\tilde{g}_{G,i} - \frac{a+\gamma\mu(1+\mu)-\theta_A\gamma\mu}{\Lambda}c + \frac{\eta\gamma\mu\alpha}{\Lambda}\varepsilon_A \tag{9}$$

$$g^*_{i,MU} = \left[\frac{a\gamma(b+\gamma)+\gamma\mu^2 b[b\Psi_i+\gamma]}{(b+\gamma)\Lambda}\right]\tilde{g}_{G,i} + \frac{b\mu(1-\theta_A)-a}{\Lambda}c - \frac{\eta b\mu\alpha}{\Lambda}\varepsilon_A \tag{10}$$

From equation (8), we see that the common monetary policy (inflation rate) depends on the average expenditure target in the area while it only stabilizes the average supply shock. The CCB also fully internalizes the negative output externality of national monetary policies, lessening its incentive to boost output through unexpected inflation. With the CCB now determining seigniorage revenues according to union-wide objectives, policymakers must adjust national tax and expenditure choices with respect to the regime of monetary

autonomy. These modifications have ambiguous welfare effects. On the one hand, greater monetary discipline (captured by θ_A) is welcome by all members because it lessens the fiscal distortions induced by the inflation bias prevailing under autonomy. On the other hand, cross-country differences in spending objectives bring about changes in national fiscal policies that may not be desirable, especially for those member states with an "extreme" position in the distribution of spending objectives—countries characterized by sizable deviations of Ψ_i from 1. Clearly, member states with relatively low spending targets ($\Psi_i > 1$) will lose on that count because the CCB will transfer them too much revenue, which reinforces the distortion prevailing under autonomy. If large enough, this effect may more than offset the gains derived from the pseudo-conservatism of the CCB. Conversely, policymakers aiming at relatively high fiscal spending ($\Psi_i < 1$) may expect extra benefits from their participation in the MU for the exactly opposite reason.

After collecting key stylized facts about the West African countries concerned by our analysis, we calibrate the theoretical model and assess the desirability of various configurations of monetary unions in the region.

III. Stylized Facts Concerning West Africa

The model summarized above implies that for any country, the net gains from joining a monetary union depend on: (1) correlation of their shocks with other members; (2) differences in fiscal policy distortions; and (3) beggar-thy-neighbor national monetary policies operating through the strength of trade linkages. Other assumptions of the model are that size differences among countries influence the prospects of particular monetary union configurations, and that in addition to tax revenue, government spending is financed through seigniorage. We now review the stylized facts regarding these points in West Africa.

A. Asymmetric Shocks

An important source of shocks, especially for countries whose main exports are primary commodities, is the terms of trade (TOT). Table 1 shows standard deviations of changes in the TOT and calculates the correlations between countries in the region. In Masson and Pattillo, (2000) we pointed out several notable features: *First*, there are large differences in the size of the shocks facing different countries. Nigeria and The Gambia have the largest standard deviation of terms of trade changes. These two countries, as well as Guinea and Niger, are each dependent on a single commodity for 50 percent or more of their export earnings (Cashin and Pattillo, 2000). *Second*, these shocks to the TOT of ECOWAS countries are typically not well-correlated, due in large part to differences in commodity exports, and the fact that the world prices of the various commodities do not move together. Nigeria is a substantial oil exporter, while most of the other countries of the region are net oil importers. As a result, Nigeria's TOT changes are negatively correlated on average with those of the rest of ECOWAS, as are Niger's. *Third*, the correlations tend to be higher for the WAEMU countries among themselves than either the correlation of WAEMU with non-WAEMU countries or the correlations among non-WAEMU countries.

Table 1. Openness, Standard Deviation and Correlation of Terms of Trade Shocks

		Standard Deviation of TOT shocks		Correlation of Terms of Trade Shocks										
	Openness 1/	Scaled	Unscaled	Benin	Burkina Faso	Cote d'Ivoire	Mali	Niger	Senegal	Togo	Gambia, The	Ghana	Guinea	Nigeria	Sierra Leone
Benin	61	0.178	0.109		0.56 *	0.22	0.43 **	-0.03	0.46 **	0.28	0.14	0.33	-0.19	0.07	0.19
Burkina Faso	43	0.072	0.031	0.56 *		0.06	0.94 *	-0.02	0.57 *	0.11	0.37	0.16	0.26	0.02	0.06
Cote d'Ivoire	82	0.063	0.052	0.22	0.06		-0.01	-0.40 **	0.59 *	0.52 *	0.36	0.75 *	-0.16	-0.23	0.65 *
Mali	63	0.051	0.032	0.43 **	0.94 *	-0.01		-0.06	0.48 *	0.07	0.26	0.08	0.32	0.01	-0.05
Niger	47	0.064	0.03	-0.03	-0.02	-0.40 **	-0.06		-0.57 *	-0.41 **	-0.31	0.05	-0.13	-0.17	0.06
Senegal	67	0.065	0.043	0.46 **	0.57 *	0.59 *	0.48 *	-0.57 *		0.49 *	0.62 *	0.28	0.33	0.09	0.15
Togo	76	0.081	0.062	0.28	0.11	0.52 *	0.07	-0.41 **	0.49 *		0.03	0.14	0.07	0.27	0.26
Gambia, The	154	0.186	0.286	0.14	0.37	0.36	0.26	-0.31	0.62 *	0.03		0.17	0.54 *	0.06	0.17
Ghana	62	0.111	0.069	0.33	0.16	0.75 *	0.08	0.05	0.28	0.14	0.17		-0.41	-0.54 *	0.62 *
Guinea	39	0.073	0.029	-0.19	0.26	-0.16	0.32	-0.13	0.33	0.07	0.54 *	-0.41		0.59 *	-0.44
Nigeria	71	0.215	0.152	0.07	0.02	-0.23	0.01	-0.17	0.09	0.27	0.06	-0.54 *	0.59 *		-0.38
Sierra Leone	45	0.063	0.028	0.19	0.06	0.65 *	-0.05	0.06	0.15	0.26	0.17	0.62 *	-0.44	-0.38	
Average All				0.19	0.24	0.18	0.19	-0.15	0.27	0.14	0.19	0.13	0.06	-0.02	0.10
Average WAEMU				0.32	0.37	0.16	0.31	-0.25	0.34	0.17	0.21	0.26	0.07	0.01	0.19
Average Non-WAEMU				0.08	0.13	0.20	0.09	-0.07	0.21	0.11	0.16	-0.03	0.05	-0.05	0.00

Source: Calculated from the Terms of Trade Index (1987=100,US$-based), World Tables (World Bank). Openness calculated from the IMF's *Balance of Payments Yearbook 2001*, *Direction of Trade Statistics 2001*, and *International Financial Statistics*.

* Significant at 5 percent level.

** Significant at 10 percent level.

1/Calculated as the sum of exports and imports as a percent of GDP.

B. Political Distortions

When we calibrate the model below, we attempt to estimate the extent to which government spending objectives exceed the socially optimal objectives. Objectives are, of course, unobservable, so here we also discuss some stylized facts supporting levels of total actual government spending that may be higher than socially optimal and cross-country differences in the extent of these distortions.

First, at the most general level, analysis of the efficiency of government spending suggests that some portion of government spending in Africa is not socially beneficial. For government expenditure on education and health, African countries are less efficient than countries in Asia and the Western Hemisphere (Gupta et al.,1997), although there are large cross-country differences.

Second, the level of corruption is another indicator of the extent of socially wasteful spending that benefits constituencies favored by the government. Table 2 compares corruption measures from a new governance dataset for the ECOWAS countries with the average for the rest of SSA, as well as the global sample. African countries have corruption scores that are much worse than the averages for the whole sample. There are also large difference in the scores across the ECOWAS countries, with Niger and Nigeria scoring the worst on corruption and The Gambia scoring the best.

While corruption scores attempt to measure the extent to which politicians and bureaucrats siphon off public funds for themselves and their cronies, there are other aspects of the institutional environment that also affect political distortions in government spending. Using International Country Risk Guide (ICRG) data, we form an institutional quality index, which combines measures of democratic accountability, corruption, government stability, bureaucratic quality, and rule of law. This index, similar to ones used in the literature on institutions and growth, is used below as an input in calibrating the "diversion wedge" in the model. Table 2 shows that the average institutional quality index for both WAEMU and WAMZ is lower than the average for SSA. The Gambia, Ghana, Côte d'Ivoire, and Senegal have the highest indices for the countries considered, while Sierra Leone, Togo, and Mali are at the low end of the scale.

C. Intraregional Trade and Risk of Competitive Monetary Expansions

The externality in the model—the negative effect of inflation surprises in one country on neighboring countries' output, operates through intraregional trade linkages. As reported in Masson and Pattillo (2001), internal trade within the ECOWAS region is relatively small, at a little over 10 percent of the average of exports and imports. The WAEMU countries trade considerably more among themselves than do the WAMZ countries.[12]

[12] Tests of whether WAEMU has increased intraregional trade are mixed; note also that since the group is both a monetary union and an economic union with preferential trading arrangements both sets of effects are captured.

Table 2. Corruption and Institutional Quality Indices

	Corruption 1/	ICRG Institutional Quality Index 2/
Gambia,The	-0.02	5.62
Ghana	-0.30	5.56
Guinea	-0.85	4.59
Nigeria	-0.95	4.20
Sierra Leone	-0.02	2.98
WAMZ average	-0.43	4.59
Benin	-0.78	
Burkina Faso	-0.37	4.31
Côte d'Ivoire	-0.08	5.53
Mali	-0.48	3.42
Niger	-1.57	3.96
Senegal	-0.24	5.27
Togo	-0.24	3.41
WAEMU average	-0.54	4.32
Sub-Saharan Africa	-0.48	4.68
The Whole sample	0.00	

Sources: Corruption scores from Kaufman et al. (1999a, 1999b); International Country Risk Guide (ICRG) from PRS Group.

1/ Scores range from -2.5 to 2.5, with higher numbers indicating less corruption.
2/ ICRG index is average of scores for measures of democratic accountability, corruption, government stability, bureaucratic quality, and rule of law. Scores range from 0 to 10, with higher numbers indicating better institutions.

There is also considerable informal trade in the region, reflecting efforts to avoid trade restrictions and trade taxes, difficulties in acquiring convertible currencies, and traditional trade patterns (e.g., between coastal states and the Sahel) that are not picked up in the official statistics. Intraregional trade figures might be quite a bit higher if it were possible to account for informal trade.

Section IV calibrates the externality parameters using data for country *i's* exports to country *k*, scaled by the GDP of country *i* (Appendix I, Table 11). The trade data used in this matrix reflects the following particularly strong relationships: sizable exports of Benin to its neighbor Togo, of Côte d'Ivoire to Nigeria, Togo to Ghana, Ghana to Nigeria, and Nigeria to Niger and Togo.

D. Size Differences

An assumption of the model is that size differences across the countries influence the net gains to forming alternative monetary unions, because the political influence exerted on the central bank is proportional to the relative economic size of the member states. There are large differences in the sizes of ECOWAS countries. Nigeria, of course, is the dominant economy, with over half the population and 40 percent of the GDP of ECOWAS and close to 70 percent of the GDP of the WAMZ countries proposing a second monetary union. The second largest country, Côte d'Ivoire, would represent 17 percent of a monetary union of the 13 ECOWAS countries; at the other end of the scale, The Gambia would constitute less than 1 percent.

E. Seigniorage

Seigniorage can be an important source of financing for governments, particularly in economies such as the ECOWAS countries, with narrow tax bases, high costs of other forms of revenue collection, and limited alternative financial assets available to the private sector. Since financial and exchange rate liberalization lower the seigniorage capacity of governments (Adam et al., 1996) we would expect a lower current contribution of seigniorage than in the early 1990s. Of course, seigniorage will also be lower for countries in the WAEMU monetary union, as inflation has typically been low.

Clearly, countries with large budget deficits may be tempted to rely more on indirect financing mechanisms such as seigniorage.[13] More generally, underlying fiscal imbalances have been shown to be an important source of inflation in the WAMZ countries (for example, Moser, 1995, for Nigeria; Ghartey, 2001, for Ghana). Another recent study of sources of inflation in developing countries found that factors associated with fiscal influences (money growth and exchange rate changes) contributed the most to inflation in flexible exchange rate countries (WAMZ countries have officially flexible rates), while inertial factors dominate the inflation process in fixed exchange rate countries, including several of the WAEMU countries (Loungani and Swagel, 2001).

F. Fiscal Positions

Table 3 shows that on average during 1996–2000, relative to WAMZ countries, WAEMU countries had higher revenue, lower spending, lower deficits (as ratios to GDP) and substantially lower inflation. While a discussion of fiscal trends in the region is beyond the scope of this paper, a few points should be noted. First, the better average fiscal performance of WAEMU over this period may also have resulted from France's surveillance role associated to its external guarantee of the CFA franc's convertibility—a factor not accounted for in this paper's model. Second, period averages can conceal large variability.

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[13] For example, Davies (2000) estimates that in Sierra Leone, seigniorage revenue reached 10-13 percent of GDP during the late 1970s-early 1980s, financing a large part of the government deficits.

For example, while fiscal performance in WAEMU generally improved in the post-devaluation period 1994–97, there has been marked deterioration since then, partly due to unfavorable terms of trade developments, but also caused by weak policies in several countries (Doré and Masson, 2002). Third, WAEMU fiscal performance has not always been better than that of the other ECOWAS countries. The CFA zone had generally higher deficits in the 1980s; the role of real exchange rate misalignment and political interests in France and zone members has been analyzed elsewhere (Nashashibi and Bazzoni, 1994; Stasavage, 1996).

Table 3. Government Spending, Revenue, Deficits in Inflation 1996-2000, and GDP Shares

	Revenue/GDP	Spending/GDP	Deficit/GDP 1/	Inflation 2/	Shares of GDP, ω 3/ (In percent)
WAEMU:					41.23
Benin	18.87	18.45	0.43	3.73	3.40
Burkina Faso	21.15	24.91	-3.76	2.43	4.06
Cote D Ivoire	18.69	20.75	-2.06	2.89	17.06
Mali	20.21	22.8	-2.59	1.72	4.07
Niger	13.09	16.08	-2.98	2.67	3.01
Senegal	19.88	20.19	-0.3	1.41	7.49
Togo	15.66	19.69	-4.03	3.15	2.15
Average	18.22	20.41	-2.19	2.57	
WAMZ:					58.77
Gambia, The	19.88	24.49	-4.61	1.93	0.61
Ghana	19.45	28.24	-8.78	25.33	10.78
Guinea	13.79	16.40	-2.61	--	5.97
Nigeria	17.47	31.43	-13.96	12.27	40.37
Sierra Leone	11.88	20.14	-8.26	21.37	1.04
Average	16.49	24.14	-7.64	15.23	
ECOWAS average	17.50	21.96	-4.46	7.17	
WAEMU-WAMZ	1.73	-3.73	5.45	-12.66	

Source: IMF *International Financial Statistics.*
1/ If negative.
2/ In percent.
3/ Based on 1998 figures for GDP in U.S. dollars.

IV. CALIBRATION

To calibrate the model, we need to determine values for parameters related of the supply function (equation (1)), the government budget constraint (equation (2)), and the government utility function (equation (3)). Some of these parameters are country-specific, and others are assumed to be the same for all countries.

Looking first at the log-linear supply function (1), we interpret the shocks as terms-of-trade disturbances so that a measure of the importance of the latter on output is needed. A natural scaling is by openness, as measured by the ratio of the sum of exports and imports to GDP. The standard deviation of the TOT shocks is thus scaled by openness to get the relevant σ_ε. (see columns 1-3 of Table 1) [14] One of the key considerations in discussing the costs of monetary unions is the correlation of shocks among participating countries. We use the correlation matrix of terms of trade shocks (Table 1).

Turning to the externality parameters, the $\theta_{i,k}$'s are calibrated to the data for country *i's* exports to country *k*, scaled by the GDP of country *i*, since we are considering the supply function for country *i*. This matrix is given in Appendix I, Table 11, and is based on DOT data, taken for 1999 or the most recent year for which data were available. There are many zeros, which may be due to missing data rather than the absence of trade. Moreover, informal trade is by definition omitted, so we make an ad hoc adjustment for it by increasing all the $\theta_{i,k}$ by 25 percent.

Another parameter deriving from the supply function is θ_A, which depends on the composition of the monetary union: it is a GDP weighted average of the trade linkages among the various countries that are included, scaled by the total GDP of the zone. In particular, if the set A represents the countries in the monetary union (by convention we make $\theta_{i,i} = 0$)

$$\theta_A = \sum_{i \in A} \sum_{j \in A} \omega_i \theta_{i,j} / \sum_{i \in A} \omega_i$$

where ω_i is the GDP share of country *i* in the region. Equating ω_i's with the GDP weights reported in Table 3, we obtain θ_A=*0.0399* for the WAEMU and θ_A=*0.0591* for the full ECOWAS monetary union.

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[14] Openness is calculated from exports and imports of goods and services taken either from the *Balance of Payments Yearbook 2001,* the *Direction of Trade Statistics Yearbook 2001*, or *International Financial Statistics.* Generally, the sources agreed, but in some cases data were missing or a very low ratio suggested data problems, so an alternative source was used.

Second, turning to the government instantaneous budget constraint (equation (2)), data for inflation and government spending and taxes as ratios to GDP are readily available (Table 3) and allow calculation of μ, the hypothetical tax base on which to apply the inflation tax in order to balance the government's budget. Since the model requires this parameter to be the same for all countries, we calculate it from the average for the five non-WAEMU countries in our sample.[15] An alternative would be to use the money/income ratio. However, it would hardly be consistent with the no-borrowing constraint of equation (2) and may not capture all the sources of seigniorage. The deficit (with sign reversed), divided by inflation, provides the estimate: $\mu = 7.64 / 15.23 = .50$

Third, we have emphasized the role of political distortions, reflected in the different spending *targets* in the government and social utility functions. The spending targets depend on the "true" socially preferred levels and a political distortion. As argued above, politically motivated decision makers tend to spend on items that specifically benefit themselves or their cronies. In terms of unconstrained policy objectives, those extra expenses come on top of the socially optimal expenditure level ($\widetilde{g}_S$) to give the government's total expenditure target ($\widetilde{g}_G$). Estimating the concrete importance of such distortions is challenging because they concern unobservable policy goals while actual data reflect policy intentions "filtered" by financial and other constraints. Of course, such constraints do not prevent the behavior at the origin of the political spending bias and in practice, politically motivated expenses absorb resources *diverted* from socially desirable projects, leading to an underspending bias on those specific items. We may thus argue that there exists a mapping from the extent of *actual* resource diversion to the overspending bias affecting unobservable *targets* so that estimates of the former could be used as proxies of the latter.

To estimate resource diversion, we assume that it mainly depends on the quality of domestic institutions.[16] As shown in the growing literature on the economic impact of institutions (e.g. Mauro, 1998 and Gupta, Davoodi and Tiongson, 2000), poor institutions tend to be associated with relatively small outlays in priority sectors like health and education, suggesting that lower institutional quality leads to stronger diversion effects. To estimate the latter, we consider a cross-section of African countries and run simple regressions explaining government expenditure on health and education (as of 1999).

[15] These countries are the closest to the regime of monetary discretion assumed in the theoretical model.

[16] See the second column of Table 2.

In accordance with previous studies, we find that institutional quality has a positive and significant impact on health and education expenditure. Assuming that "perfect" institutions prevent diversion,[17] we use the estimated equations to calculate the hypothetical expenditure levels that would be observed if the countries achieved the highest possible ranking in all components of our index of institutional quality. The results are reported in the "no diversion" columns of Table 4. For each sector, resource diversion is simply the difference between the actual and the hypothetical figures.

Table 4 also expresses resource diversion from health and education in terms of their no-diversion levels. If all forms of productive spending were subject to the same diversion practices as health and education, these figures would represent total resource diversion and could therefore be used as proxies of the political overspending distortion in proportion of the socially optimal expenditure target. Since the true socially optimal spending objectives are unobservable, we use the estimated overspending distortion to obtain proxies of governments targets.[18] In particular, to be conservative in our estimates, we apply *half* of the percentage distortions to the actual spending ratios to get the government targets, as ratios to GDP.[19] For each country, the value of the Ψ parameter will depend on those estimated targets and on the membership of the monetary union in which participation is envisaged.

Fourth, to calibrate the utility function parameters, we use the observed fiscal data for countries in the region. The model implies that incentives for inflation creation and government spending will be different in a monetary union from those with an independent currency. In particular, countries in a monetary union (all other things equal) should have higher taxes and lower government spending, for a given level of the spending objective. It can be seen from Table 3 that government spending is in fact lower in the WAEMU, while the tax ratio is higher, as is predicted by the model. Appendix I describes in detail the calibration of utility function parameters $a, b,$ and γ as functions of c.

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[17] Admittedly, perfect institutions are not of this world. The same is probably true for the absence of political distortions in the policymaking process.

[18] The fact that actual spending systematically falls short of the target is consistent with the prediction of the DMP model.

[19] We examine sensitivity of the results to the distortion estimate in the Appendix. Table 13 gives net gains from monetary union when the base case distortions are *doubled* (i.e. restored to the resource diversion estimates of Table 4).

Table 4. Expenditure on Priority Sectors: Estimates of the Diversion Effect

	Health (1999)		Education (1999)		Diversion in Percent of No Diversion	Government Spending	
	Actual	No Diversion	Actual	No Diversion		Actual 1/	Target
	In percentage of GDP						
Benin 2/	n.a.	n.a.	n.a.	n.a.	n.a.	18.5	21.6
Burkina Faso	1.2	2.6	2.0	2.9	42.2	24.9	30.2
Cote d'Ivoire	1.2	2.3	5.5	6.2	21.5	20.8	23.0
Gambia, The	1.6	2.6	2.6	3.2	29.3	24.5	28.1
Ghana	1.4	2.7	n.a.	n.a.	47.7	28.2	35.0
Guinea	2.1	3.3	1.6	2.4	35.7	16.4	19.3
Mali	1.9	3.4	2.2	3.2	38.2	22.8	27.2
Niger	1.4	2.8	n.a.	n.a.	49.9	16.1	20.1
Nigeria	0.7	2.4	n.a.	n.a.	70.6	31.4	42.5
Senegal	2.6	3.6	3.6	4.3	21.6	20.2	22.4
Sierra Leone	1.0	2.7	1.1	2.2	57.6	20.1	25.9
Togo	1.1	2.8	4.2	5.2	34.0	19.7	23.0
ECOWAS average	1.5	2.8	2.8	3.7	40.8	22.0	26.5
WAEMU average	1.6	2.9	3.5	4.4	34.6	20.4	23.9
WAMZ average	1.4	2.7	1.7	2.6	48.5	22.8	30.2

Note: The health expenditure regression includes a constant, the log of GDP per capita at PPP (average 1990–97), an index of institutional quality (simple average of ICRG indices for political stability, democratic accountability and corruption), a dummy identifying countries with HIV/AIDS prevalence rate above 10 percent, life expectancy and infant mortality. The sample consists of 34 African countries and estimates were obtained by OLS, correcting standard errors for heteroskedasticity. No institutional data were available for Benin. The education expenditure regression includes a constant, the log of GDP per capita at PPP (average 1984–98), illiteracy and an interaction variable between illiteracy and institutional quality (simple average of ICRG indices for political stability, democratic accountability, corruption, rule of law and bureaucratic quality). Here, the sample only consists of 24 African countries due to missing data.
Averages across countries are unweighted.

1/ Average over 1996–2000.
2/ For Benin, the spending target is based on WAEMU average diversion.

To make sense, the model needs to have positive values for all four of these parameters. For our baseline we chose $c=1$, and the corresponding values for the other parameters, namely $a=0.9657$, $b=9.0759$, $\gamma=1.7723$. As discussed in Appendix II, a search over the parameter space indicated that higher values of c (with a, b, and γ remaining proportional to c, using the formulas described in Appendix I) scaled up the gains (or losses) from monetary union, but did not change their sign. Appendix II also tested the sensitivity of the simulations to halving and doubling each of the four parameters in turn, keeping the others constant. Although the magnitude of the gains differed considerably from the baseline case presented in Section V, signs were preserved in 76 out of 96 cases (Table 12), showing that incentives to join a monetary union were relatively robust to substantial deviations from the set of baseline parameters. Moreover, out of the 20 cases where a change of sign occurred, the change was from a net loss to a net gain in 15 cases.

V. Simulations

Table 5 gives the net gains from a monetary union among existing WAEMU member states for all the countries individually, using baseline parameter values. Since the theoretical model assumes that the common central bank follows discretionary strategies, those results ignore the utility value of the particular commitment technology available to the BCEAO—WAEMU's central bank — namely a peg between the CFA franc and the euro guaranteed by the French Treasury. Such an arrangement has specific origins that are quite distinct from the constitution of a monetary union.[20]

Table 5 indicates that participation in a monetary union is better than independent policies (and separate currencies) for all of the WAEMU member states. It can be seen that the countries with the most profligate fiscal policies (values of Ψ smaller than unity), in particular Burkina Faso and Mali, are the greatest gainers relative to independent monetary policies; while the most fiscally conservative member states—Benin and Niger—post relatively small gains. As illustrated by Table 7 below, this reflects the fact that the traditional pillar of OCA analysis—the requirement of some symmetry in the shocks—is nowhere near as important as differences in spending propensities in determining net gains

[20] A similar agreement, but not in the context of monetary union, has been extended to Cape Verde by Portugal, to maintain an exchange rate link with the euro.

Table 5. WAEMU: Net Benefits 1/

Country	ω	Gain Rel. to Indep.	Correlation	Ψ
Benin	0.0824	0.0217	0.6911	1.0939
Burkina	0.0985	0.0793	0.6009	0.7847
Côte d'Ivoire	0.4137	0.0349	0.7737	1.0300
Mali	0.0987	0.0609	0.4905	0.8719
Niger	0.0729	0.0148	-0.3161	1.1780
Senegal	0.1816	0.0310	0.8331	1.0581
Togo	0.0521	0.0346	0.5628	1.0276

1/ a=0.9657,b=9.0759,γ=1.7723,c =1,η=1,μ=0.50,θ_A =0.0399.

Table 6. ECOWAS Monetary Union: Net Benefits for Participants 1/

Country	ω	Gain. Rel. to Indep.	Correlation	Ψ	Gain Rel. to WAEMU
Benin	0.0340	-0.0175	0.2677	1.4922	-0.0392
Burkina	0.0406	0.0425	0.1979	1.0704	-0.0367
Côte d'Ivoire	0.1706	-0.0042	0.0508	1.4051	-0.0390
Mali	0.0407	0.0236	0.1523	1.1893	-0.0373
Niger	0.0301	-0.0242	-0.2465	1.6069	-0.0390
Senegal	0.0749	-0.0075	0.3455	1.4434	-0.0386
Togo	0.0215	-0.0032	0.4255	1.4017	-0.0378
Gambia, The	0.0061	0.0238	0.2277	1.1499	n.a.
Ghana	0.1078	0.0692	-0.2748	0.9232	n.a.
Guinea	0.0597	-0.0275	0.5914	1.6706	n.a.
Nigeria	0.4037	0.1155	0.9429	0.7594	n.a.
Sierra Leone	0.0104	0.0147	-0.1986	1.2447	n.a.

1/ θ_A =0.0591

from monetary unification. Again, one should keep in mind that this assessment is made under the assumption that the common central bank follows discretionary strategies, and that, unlike the actual situation of the WAEMU countries, the exchange rate of the common currency can adjust to exogenous shocks. Admittedly, the utility impact of shocks would be larger than suggested by Table 7 if the decision to form the monetary union was paired with the decision to adopt an external peg for the region's currency.[21]

While fiscally profligate countries benefit from a central bank they perceive as less accommodative, the fiscally conservative member states suffer from the excessive monetary financing those less conservative countries manage to extract. This partly explains why Niger finds its participation only marginally beneficial (in addition to the negative correlation of its shocks with the rest of the Union), while Burkina Faso and Mali record above-average gains with respect to monetary autonomy. The same factors may also explain why these two countries are the only WAEMU member states that would prefer participation in a full ECOWAS monetary union over independent monetary policies (we will consider below whether this is the relevant comparison) while all but one (Guinea) of the non-WAEMU countries would express the same preference. Unsurprisingly, Guinea has the lowest estimated spending propensity among non-WAEMU countries and the largest gainer among them, Nigeria, is the most fiscally profligate country.

Looking more carefully into the various ways participation in the monetary union may affect governments' utility, we calculate the net loss/gain due to the cross-country differences in the spending objectives (A) and the net loss due to asymmetric shocks (B)—see Table 7. A residual term (C) mainly captures the net gain stemming from the reduced incentives of the CCB to boost output through unexpected inflation.

It can be seen that the disciplinary effect (C) is relatively large for all the countries considered. In contrast, the costs stemming from suboptimal stabilization in the presence of asymmetric shocks (B) are small, representing often less than 10 percent of C. As a consequence, the determining factor in the net gain or loss expected from participation in a greater ECOWAS monetary union is the country's position in the cross-country distribution of spending objectives, represented by the value of Ψ_i. In particular, Table 7 shows that the two countries characterized by $\Psi_i < 1$ (Ghana and Nigeria) exhibit a positive A, meaning that they take advantage of sharing a common central bank with more conservative member states. At the other end of the distribution, countries characterized by $\Psi_i \tilde{\geq} 1.4$ (small spending propensities relative to union's average) appear to lose more from the pressures of their profligate partners on the CCB than they gain from the disciplinary effect of centralized policy making: $|A| > C$.

[21] A formal assessment of these institutional issues is provided in Debrun, Masson and Pattillo (2002).

Table 7. Decomposition of the Net Gain from a Monetary Union Among ECOWAS Countries Relative to Monetary Autonomy

	Ψ_i	A	B	C	Net Gain/Loss
Benin	1.4922	-0.0730	-0.0068	0.0623	-0.0175
Burkina Faso	1.0704	-0.0142	-0.0022	0.0589	0.0425
Cote d'Ivoire	1.4051	-0.0635	-0.0024	0.0617	-0.0042
Mali	1.1893	-0.0346	-0.0019	0.0601	0.0236
Niger	1.6069	-0.0840	-0.0032	0.0630	-0.0242
Senegal	1.4434	-0.0678	-0.0017	0.0620	-0.0075
Togo	1.4017	-0.0631	-0.0018	0.0617	-0.0032
The Gambia	1.1499	-0.0283	-0.0077	0.0598	0.0238
Ghana	0.9232	0.0176	-0.0055	0.0571	0.0692
Guinea	1.6706	-0.0895	-0.0012	0.0632	-0.0275
Nigeria	0.7594	0.0655	-0.0041	0.0541	0.1155
Sierra Leone	1.2447	-0.0429	-0.0030	0.0606	0.0147

More relevant for WAEMU countries, however is a comparison of the full ECOWAS monetary union with the utility derived from being members of a smaller monetary union. The last column of Table 6 suggests that all WAEMU countries would record comparable losses from the full ECOWAS monetary union. Of course, that comparison ignores the induced changes in the institutional architecture of the monetary union. In particular, we do not consider the value of the BCEAO's commitment to peg the CFA franc to the euro and in practice, it is unclear whether the CCB of the full ECOWAS could rely on a comparable commitment technology. Those politically sensitive and economically crucial matters could give additional incentives to WAEMU member states to resist a wider monetary union or to strictly limit its membership. In any case, even a mere extension of the WAEMU that preserved present institutional arrangements would have to be reviewed by France and its European Union partners and it is likely that any risk of a substantial revision of the guarantee currently extended to the BCEAO would undermine the willingness of WAEMU member states to engage in a significant enlargement of the union. However, such a risk is also an opportunity for WAEMU member states in the sense that it gives them a considerable bargaining power in negotiations with potential entrants. Since our simulations clearly identify disciplinary gains as the key motivation for non-WAEMU countries (except Guinea)

to join a greater ECOWAS monetary union, WAEMU countries—as Germany during the negotiation of the Maastricht Treaty[22]—might be in a position to obtain serious institutional guarantees concerning, for instance, the statutory independence of the CCB, a monetary policy framework conducive to price stability and, the strict application of entry criteria, including the requirement for fiscal discipline.

We now turn to the question whether WAMZ makes sense on its own terms, and would likely be a feasible and durable monetary union.

The results in Table 8 indicate that it would not, for the same reasons that the full ECOWAS monetary union was not. All countries except Nigeria would be worse off than if they retained their own monetary policies. Nigeria has both very different terms of trade shocks and less disciplined fiscal policies than some of the other countries that are prospective members of the WAMZ. Given its size, it would dominate the monetary policy of the union, provided the union operated a discretionary monetary policy (rather than being tied to an external anchor, for instance). In this regard, an ECOWAS monetary union would be more desirable, as Nigeria would have a somewhat smaller weight. As proposed, the WAMZ is only viewed as a way-station toward the full ECOWAS union, and as a way of speeding the transition.

Table 8. WAMZ Monetary Union 1/

Country	ω	Gain Rel. to Indept.	Correlation	Ψ
Gambia, The	0.0103	-0.0592	0.1298	1.3652
Ghana	0.1833	-0.0121	-0.4325	1.0961
Guinea	0.1016	-0.1138	0.6109	1.9835
Nigeria	0.6870	0.0456	0.9912	0.9016
Sierra Leone	0.0178	-0.0702	-0.3191	1.4778

1/ $\theta_A = 0.0201$

[22] Debrun (2001) shows that Germany might have enjoyed a large bargaining power because other countries saw their participation in the European Monetary Union as a surrogate to building credible monetary institutions at home.

Finally, Table 9 considers whether adding a single country to a monetary union made of WAEMU countries would be incentive compatible both for the entrant and the existing members. In each case, entry is in the interest of the newcomer. However, existing members would only welcome The Gambia or Guinea, although for Sierra Leone, the negative effects on other countries are so small as to be negligible, and hence WAEMU members might not object to admitting Sierra Leone as well. In contrast, Nigeria and to much lesser extent Ghana would have negative effects on existing members if they joined. When Nigeria is added, each of the other countries' correlations with the union's average shock goes down, while Nigeria's correlation exceeds 0.9. Nigeria's dominance in terms of size would, according to our model, grant it the greatest influence on the union's monetary policy. Through this channel, the large government spending distortion and Nigeria-specific shocks to its terms of trade would have significant negative externalities on other countries. Ghana has the second largest spending propensity among WAMZ countries, and would have a significant weight in the union's monetary policy. Still, the negative effect on WAEMU members from adding Nigeria would be about ten times larger than the negative effects from adding Ghana.

As suggested earlier, changes in spending propensities at the regional level might substantially affect incentives to form monetary unions and our analysis makes clear that specific efforts aiming at a greater degree of fiscal convergence would contribute to making larger monetary unions more desirable for all member states. One way to foster convergence of fiscal performance on mutually agreed objectives would be through the implementation of a regional surveillance exercise. As in the process that led to the creation of the European Monetary Union, the membership of the union could be made conditional upon the satisfaction of these fiscal convergence criteria. To illustrate the potential importance of such a mechanism, Table 10 reports the net gains from a full ECOWAS monetary union assuming that Nigeria's government spending target $\tilde{g}_{G,i}$ is set equal to the average for the remaining 11 countries.

Interestingly enough, for all the WAEMU countries a monetary union under these conditions would be preferred to a narrower union with the same membership as the existing WAEMU, and all the non-WAEMU countries would also benefit relative to monetary autonomy. Of course, the credibility of fiscal arrangements remains an open question, especially after the monetary union has been established and is difficult to reverse. The recent experience in the euro area suggests that substantial pressures from politically influential member states to loosen the rules would be hard to resist. But we leave these important institutional issues for future research.

Table 9. Adding Countries Individually to WAEMU

Country	ω	Gain Rel to Indep.	Correlation	Ψ	Gain Rel. to WAEMU
		Adding The Gambia 1/			
Benin	0.0812	0.0221	0.6808	1.0969	0.0005
Burkina	0.0971	0.0797	0.6058	0.7868	0.0005
Côte d'Ivoire	0.4077	0.0353	0.7735	1.0328	0.0005
Mali	0.0973	0.0614	0.4921	0.8742	0.0005
Niger	0.0719	0.0152	-0.3251	1.1812	0.0005
Senegal	0.1790	0.0315	0.8459	1.0610	0.0005
Togo	0.0513	0.0350	0.5497	1.0304	0.0004
Gambia, The	0.0145	0.0615	0.4915	0.8452	n.a.
		Adding Ghana 2/			
Benin	0.0653	0.0150	0.6104	1.2022	-0.0066
Burkina	0.0781	0.0729	0.4780	0.8623	-0.0064
Côte d'Ivoire	0.3280	0.0285	0.8416	1.1319	-0.0064
Mali	0.0783	0.0544	0.3691	0.9581	-0.0065
Niger	0.0578	0.0081	-0.1956	1.2945	-0.0067
Senegal	0.1440	0.0243	0.6869	1.1628	-0.0067
Togo	0.0413	0.0278	0.4436	1.1292	-0.0067
Ghana	0.2072	0.1017	0.8466	0.7438	n.a.
		Adding Guinea 3/			
Benin	0.0720	0.0227	0.6335	1.0685	0.0010
Burkina	0.0860	0.0806	0.6426	0.7665	0.0013
Côte d'Ivoire	0.3614	0.0361	0.7206	1.0061	0.0013
Mali	0.0862	0.0623	0.5478	0.8516	0.0014
Niger	0.0637	0.0162	-0.3366	1.1506	0.0015
Senegal	0.1587	0.0324	0.8844	1.0336	0.0014
Togo	0.0455	0.0359	0.5644	1.0337	0.0013
Guinea	0.1265	0.0117	0.2176	1.1963	n.a.
		Adding Nigeria 4/			
Benin	0.0416	-0.0382	0.2246	1.5249	-0.0599
Burkina	0.0498	0.0228	0.1548	1.0938	-0.0564
Côte d'Ivoire	0.2090	-0.0251	-0.0539	1.4358	-0.0599
Mali	0.0499	0.0035	0.1201	1.2153	-0.0574
Niger	0.0369	-0.0453	-0.2394	1.6420	-0.0601
Senegal	0.0918	-0.0282	0.2764	1.4749	-0.0592
Togo	0.0263	-0.0236	0.3939	1.4324	-0.0582
Nigeria	0.4947	0.0996	0.9746	0.7760	n.a.
		Adding Sierra Leone 5/			
Benin	0.0804	0.0208	0.6861	1.0965	-0.0009
Burkina	0.0961	0.0784	0.5931	0.7865	-0.0008
Côte d'Ivoire	0.4035	0.0340	0.7825	1.0325	-0.0008
Mali	0.0963	0.0601	0.4809	0.8739	-0.0008
Niger	0.0711	0.0139	-0.3090	1.1808	-0.0009
Senegal	0.1771	0.0301	0.8245	1.0606	-0.0009
Togo	0.0508	0.0337	0.5622	1.0300	-0.0009
Sierra Leone	0.0247	0.0524	0.5075	0.9147	n.a.

1/ θ_A=0.0408.
2/ θ_A=0.0486.
3/ θ_A=0.0377.
4/ θ_A=0.0445.
5/ θ_A=0.0394.

Table 10. ECOWAS Monetary Union: Net Benefits for Participants when Nigeria's Spending Distortion is Equal to Average

Country	ω	Gain Rel to Indep.	Correlation	Ψ	Gain Rel. to WAEMU
Benin	0.0340	0.0278	0.2677	1.1721	0.0061
Burkina	0.0406	0.0853	0.1979	0.8408	0.0060
Côte d'Ivoire	0.1706	0.0407	0.0508	1.1037	0.0059
Mali	0.0407	0.0672	0.1523	0.9342	0.0063
Niger	0.0301	0.0215	-0.2465	1.2622	0.0068
Senegal	0.0749	0.0375	0.3455	1.1338	0.0065
Togo	0.0215	0.0417	0.4255	1.1011	0.0071
Gambia, The	0.0061	0.0672	0.2277	0.9032	n.a.
Ghana	0.1078	0.1105	-0.2748	0.7252	n.a.
Guinea	0.0597	0.0185	0.5914	1.3123	n.a.
Nigeria	0.4037	0.0540	0.9429	1.0000	n.a.
Sierra Leone	0.0104	0.0587	-0.1986	0.9778	n.a.

VI. Conclusions

We calibrated a model in which negative spillovers from autonomous monetary policy provide incentives for forming a monetary union; these incentives depends on the extent of trade linkages among member countries. The model also includes a distortion that causes governments to aim for excessive government spending that is higher than the socially optimal level in order to channel funds that serve the narrow interests of the group in power. We have argued that this feature, ignored in the literature on monetary union in Europe, is potentially quite important in Africa, and influences both the incentives to join a monetary union and, for existing members, the willingness to accept a new member.

Our simulations bear this out. Using actual data to calibrate the model, we find that differences in government spending propensities are more important than asymmetric shocks in determining net gains and losses from potential monetary unions. The proposed monetary union among all the countries of ECOWAS, though desirable for most of the non-WAEMU countries, is shown not to be incentive compatible for most of the existing WAEMU members in the absence of other institutional changes or gains not captured in the model. The chief reason is that Nigeria, which would have a preponderant weight in such a union, is estimated to have a high fiscal distortion. This distortion would put pressure on an ECOWAS monetary union's central bank to produce excessive inflation, and hence would lower the utility of these countries. An additional, but less important factor, is that Nigeria's terms of trade differ from those of its neighbors, and hence the average shock would have a low, or negative correlation, with other countries' shocks. Even though a monetary union would be in Nigeria's interest, it is difficult to see that all potential members would be willing to proceed with one, despite agreement in principle to do so.

In contrast, the membership of the other non-WAEMU countries individually would not pose the same problems, and the model suggests that in most cases they would increase the welfare of existing WAEMU countries as well as that of the prospective new members.

The problem of disparities in spending propensities for the formation of a monetary union, and for its ongoing monetary policy, suggests a need for regional surveillance mechanisms to ensure a certain degree of convergence in fiscal policies. If Nigeria's spending target were equal to the average for the other countries, a full-ECOWAS monetary union would be incentive compatible for all countries. While the design of such regional surveillance is outside the scope of this paper, we conclude that lack of fiscal convergence, not the low level of regional trade or the asymmetry of shocks, is the primary obstacle to the creation of a well-functioning and acceptable monetary union in West Africa.

Calibration

A comparison of equations (8)-(10) with equations (4)-(6) helps us pin down some of the utility function parameters. The effect of monetary union (all other things equal) will be to increase taxes and lower government spending, for a given level of the spending objective. However, countries also may differ with respect to their spending targets. Calling $\Delta\tau$ and Δg the difference in the tax and spending ratios (monetary union minus the non-monetary union countries), and $\Delta\tilde{g}$ the difference in spending propensities (i.e., targets), a comparison of two countries, one of which is in a monetary union and the other is not, yields

$$\Delta\tau = \frac{\theta_A \gamma\mu c + a\gamma\Delta\tilde{g}}{a(b+\gamma)+b\mu^2\gamma} \tag{A1}$$

and

$$\Delta g = \frac{-b\theta_A\mu c - (a\gamma+\gamma\mu^2 b)\Delta\tilde{g}}{a(b+\gamma)+b\mu^2\gamma} \tag{A2}$$

$$\Delta\pi = \frac{-\theta_A(b+\gamma)c+\gamma\mu b\Delta\tilde{g}}{a(b+\gamma)+b\mu^2\gamma} \tag{A3}$$

If we compare two countries, which are both in a monetary union or outside of one, then the first term of the numerator (in θ_A) disappears. In this case, equations (A1) and (A3) yield

$$\frac{\Delta\tau}{\Delta\pi} = \frac{a}{\mu b} \tag{A4}$$

and we can use this to calibrate a as a function of b. We compare Ghana and Nigeria, both of which are outside a monetary union, and this case equation A4 gives us

$$a = \mu\frac{.0199}{.1206}b = .08250b$$

If we compare two countries (one inside, the other outside, a monetary union) with the same spending propensities, then equations A1-A2 yield another simple relationship:

$$\gamma = -\frac{\Delta\tau}{\Delta g}b \tag{A5}$$

The Gambia and Mali have roughly equal values of $\tilde{g}$. Using their data in equation (A5) gives

$$\gamma = 0.19527b$$

If we substitute equation A5 back into equation A1 (with $\Delta\tilde{g} = 0$), and solve for b, using the values for Mali and The Gambia:

$$b = \frac{a(\Delta g - \Delta\tau) + \theta_A \mu c}{\Delta\tau\mu^2} = -2.02b + .01995c = 8.0072c \qquad \text{(A6)}$$

This then gives us 3 equations that determine *a, b, and* γ as functions of c.

Table 11. Theta (i, k): Importance of Inflation Surprises in Country at Top for Country at Left 1/

	Benin	Burkina	Cote d'Ivoire	Mali	Niger	Senegal	Togo	UEMOA	Gambia	Ghana	Guinea	Nigeria	Sierra Leone	WAMZ
Benin	0.0000	0.0004	0.0000	0.0004	0.0021	0.0004	0.0004	0.0039	0.0000	0.0000	0.0000	0.0004	0.0000	0.0004
Burkina 1/	0.0004	0.0000	0.0072	0.0011	0.0011	0.0000	0.0011	0.0108	0.0000	0.0022	0.0000	0.0000	0.0000	0.0022
Côte d'Ivoire	0.0037	0.0110	0.0000	0.0195	0.0034	0.0124	0.0075	0.0576	0.0010	0.0115	0.0045	0.0034	0.0008	0.0212
Mali	0.0000	0.0007	0.0011	0.0000	0.0004	0.0000	0.0000	0.0022	0.0000	0.0000	0.0000	0.0011	0.0000	0.0011
Niger	0.0019	0.0005	0.0015	0.0000	0.0000	0.0000	0.0000	0.0039	0.0000	0.0000	0.0000	0.0369	0.0000	0.0369
Senegal	0.0047	0.0010	0.0029	0.0105	0.0002	0.0000	0.0012	0.0205	0.0043	0.0008	0.0021	0.0004	0.0004	0.0080
Togo	0.0333	0.0068	0.0014	0.0020	0.0048	0.0000	0.0000	0.0483	0.0000	0.0116	0.0000	0.0272	0.0000	0.0387
Total UEMOA	0.0043	0.0052	0.0015	0.0102	0.0020	0.0052	0.0035	0.0319	0.0012	0.0057	0.0023	0.0057	0.0004	0.0153
Gambia, The	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Ghana	0.0033	0.0008	0.0003	0.0000	0.0008	0.0004	0.0382	0.0438	0.0001	0.0000	0.0000	0.0106	0.0000	0.0107
Guinea	0.0000	0.0000	0.0022	0.0000	0.0000	0.0000	0.0000	0.0022	0.0000	0.0000	0.0000	0.0017	0.0000	0.0017
Nigeria	0.0004	0.0006	0.0217	0.0000	0.0009	0.0097	0.0002	0.0335	0.0000	0.0197	0.0001	0.0000	0.0005	0.0203
Sierra Leone	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total WAMZ	0.0008	0.0006	0.0152	0.0000	0.0008	0.0067	0.0071	0.0313	0.0000	0.0135	0.0001	0.0021	0.0003	0.0161

1/ calculated as exports of i to k, divided by GDP of i.

Sensitivity

In order to examine the robustness of the results, the ECOWAS monetary union was also analyzed for different values of a, b, c, and γ, in particular by halving and doubling each parameter in turn.[23] The results are presented in Table 12. For example, column 1 gives $\frac{E_{-1}G_i^{a=.9657/2} - E_{-1}G_i^{a=.9657}}{E_{-1}G_i^{a=.9657}} \bullet 100$ where $E_{-1}G_i = E_{-1}U_i^G|_{MU} - E_{-1}U_i^G|_{Aut}$. It is important to note that the denominator can have either sign. In both cases, a negative value in the table in excess of 100 indicates a change of sign in the net gain relative to the baseline. These changes in sign are indicated in bold in the table, as are positive values in excess of 100, which indicate a doubling (at least) of the net gains or losses, while preserving their sign.

Table 12. ECOWAS Monetary Union: Change in Net Benefits for Participants as a Percent of Baseline Gains or Losses, as a Result of Scaling Parameters

	a		*b*		*c*		*γ*	
Country	.5	2	.5	2	.5	2	.5	2
Benin	6	30	-55	32	59	**-615**	-197	**223**
Burkina	56	-50	10	-6	-87	**379**	35	-38
Côte d'Ivoire	-15	63	**-212**	**125**	**350**	**-2791**	**-766**	**860**
Mali	59	-55	26	-15	**-117**	**603**	92	**-102**
Niger	36	-17	-45	27	23	**-405**	**-161**	**184**
Senegal	25	1	**-123**	73	**168**	**-1491**	**-445**	**501**
Togo	-13	60	**-278**	**164**	**463**	**-3661**	**-1001**	**1124**
Gambia	87	-98	22	-13	**-128**	**621**	78	-86
Ghana	59	-54	1	-1	-75	**276**	5	-6
Guinea	45	-32	-42	25	12	**-341**	**-150**	172
Nigeria	54	-47	-3	2	-65	**206**	-10	10
Sierra Leone	73	-78	46	-27	**-162**	**918**	**167**	**-185**

[23] Doubling or halving c, while maintaining the proportionality between it and $a, b,$ *and* γ, serves only to double or halve the net gain or loss from monetary union.

Comparing with Table 6, it can be seen that increasing *a* relative to the baseline tends to reduce the losses from monetary union (making them less negative, as indicated by a negative sign in Table 12), since it increases the value of low inflation. For all countries, however, the sign is preserved (the absolute change is less than 100 percent). In contrast, cutting *b* eliminates the net loss for Côte d'Ivoire, Senegal and Togo. The net gains are seen to be very sensitive to *c*. Reducing *c* by half tends to reduce the magnitude of both net gains and net losses, changing their signs in the cases of Mali, The Gambia and Sierra Leone. Doubling *c* relative to baseline has effects in the opposite direction, but of considerably larger magnitude. Changing γ has a substantial effect, with changes in signs of net gains or losses occurring in several cases.

Table 13 examines the sensitivity of net gains to the estimate of political distortion on government spending. Estimates of this percentage distortion relative to actual government spending to GDP ratios are doubled for all countries, when considering a full ECOWAS monetary union. A comparison with Table 6 shows that this increases the net losses for all the losers and the net gains of Nigeria and Ghana but reduces the net gains of the others while all the signs are preserved.

Table 13. ECOWAS Monetary Union: Net Benefits for Participants when Spending Distortions Doubled

Country	ω	Gain Rel. to Indep.	Correlation	Ψ	Gain Rel. to WAEMU
Benin	0.0340	-0.0413	0.2677	1.5702	-0.0642
Burkina	0.0406	0.0334	0.1979	1.1005	-0.0595
Côte d'Ivoire	0.1706	-0.0342	0.0508	1.5463	-0.0642
Mali	0.0407	0.0083	0.1523	1.2376	-0.0609
Niger	0.0301	-0.0425	-0.2465	1.6170	-0.0639
Senegal	0.0749	-0.0381	0.3455	1.5878	-0.0638
Togo	0.0215	-0.0256	0.4255	1.4777	-0.0624
Gambia	0.0061	0.0037	0.2277	1.2309	--
Ghana	0.1078	0.0694	-0.2748	0.9347	--
Guinea	0.0597	-0.0534	0.5914	1.7517	--
Nigeria	0.4037	0.1405	0.9429	0.7272	--
Sierra Leone	0.0104	0.0088	-0.1986	1.2282	--

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