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Welfare Effects of Monetary Integration: the Common Monetary Area and Beyond

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Abstract

This paper proposes a quantitative assessment of the welfare effects arising from the Common Monetary Area (CMA) and an array of broader grouping among Southern African Development Community (SADC) countries. Model simulations suggest that (i) participating in the CMA benefits all members; (ii) joining the CMA individually is beneficial for all SADC members except Angola, Mauritius and Tanzania; (iii) creating a symmetric CMA-wide monetary union with a regional central bank carries some costs in terms of foregone anti-inflationary credibility; and (iv) SADC-wide symmetric monetary union continues to be beneficial for all except Mauritius, although the gains for existing CMA members are likely to be limited.

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I. INTRODUCTION

The formation of currency unions has always been accompanied by intense debates on their costs and benefits for potential members. Even if monetary integration often has an important political dimension, it rarely transcends national interest. Ultimately, “*no nation has friends, only interests*,” Charles de Gaulle, the late President of France, once observed. And in fact, as soon as serious tensions emerge within existing monetary unions such as the euro area, existential questions about the potential merits of monetary sovereignty often resurface. This paper proposes a model-based assessment of this particular question in the existing Southern African Common Monetary Area (CMA) and hypothetical expansions of it.

By nature, the simulation exercises developed in this chapter can only be partial and *positive*. As such, they do not constitute (and cannot be interpreted as) *normative* assessments underpinning a specific policy advice. In particular, there is no pretense that the model-based estimation of “optimal” macroeconomic policies precisely describes what governments and central banks should do (or what they would do under counterfactual benchmarks). Also, a model cannot provide a complete picture of the costs and benefits of monetary integration because to remain tractable, it must ignore critical dimensions of it, including the combination of political interests and the varying levels of institutional preparedness across potential members.

Pioneered by Mundell (1961), a vast literature on the costs and benefits of monetary unions mushroomed in the wake of the creation of the euro in 1999. Early studies on “*optimum currency areas*” (OCAs) emphasized the costs for structurally different countries affected by different shocks to opt for a common monetary policy. Hence, absent fluid labor and capital flows across countries or a fiscal union offering some risk sharing through interregional transfers, it was generally thought that prospective members of a currency union should first reach a reasonable degree of economic convergence.

The debate on the euro in the 1990s remained dominated by these OCA “Mark I” arguments where the benefits are largely assumed and the costs are directly proportional to the magnitude of cross-country divergences along selected dimensions. This thinking provided a theoretical underpinning for convergence criteria that prospective union members should comply with. Yet an intense controversy developed around the need to have convergence criteria on public debts and deficits and to turn these criteria into permanent constraints once in the euro area. This heavily polarized issue created a demand for formal economic models looking into the implications of monetary unification for the coordination of the monetary-fiscal policy mix. Unlike OCA-based studies, models by Beetsma and Bovenberg (1998, 1999), among others, revealed explicit benefits of monetary unification in terms of credible monetary policy coordination and a better insulation of the common central bank from inflationary pressures motivated by public finances considerations.

Debrun, Masson, and Pattillo (2005) developed a model—hereafter DMP—along those lines and calibrated it to assess the net gains from monetary unification in various regions of Africa (Masson and Pattillo, 2005; Debrun, Masson and Pattillo, 2008 and 2011). The model allows for a simple and intuitive assessment of the costs and benefits of a given currency

union. DMP simulations—which essentially compare the costs of losing monetary sovereignty to gains in terms of greater policy credibility—generally suggest that existing monetary unions in Africa can be beneficial for all or most of their members when compared to the hypothetical counterfactual of a fully flexible exchange rate. The main driver of these credibility gains is that the power of individual governments to extract a higher inflation tax from the regional central bank is diluted proportionally to their influence on the conduct of the regional monetary policy. As a result, larger currency unions are more likely to be beneficial for all members unless newcomers are relatively large, fiscally undisciplined, and without meaningful trade linkages with the rest of the union. In relative terms, the costs owing to asymmetric shocks emphasized by the traditional OCA literature—which rather pleads for smaller currency unions composed of countries facing similar terms-of-trade shocks—are small.

In this paper, a fully updated calibration of DMP is used to assess the net gains arising from the CMA and a number of hypothetical variants selected for their illustrative value of the model's properties rather than their actual plausibility.¹ Specifically, we look at the welfare impact of (i) being a member of the CMA, (ii) expanding the CMA, (iii) establishing a regional central bank conducting monetary policy on the basis of union-wide conditions, and (iv) combinations of (ii) and (iii). On (i), the model suggests there are significant benefits of being a member of the CMA, particularly for Lesotho and Swaziland. On (ii), a larger CMA including all current Southern African Development Community (SADC) members is desirable for all except the fiscally conservative Mauritius and Tanzania, and possibly Angola, whose terms of trade are very volatile and uncorrelated with its neighbors. On (iii), the creation of a genuine CMA-wide monetary union with a regional central bank carries some costs in terms of foregone anti-inflationary credibility, because fiscally profligate countries could, despite their small size, extract a higher inflation tax. All members would be better off maintaining the current asymmetric CMA regime where South Africa sets monetary policy. Finally, creating an SADC-wide currency union under the helm of a regional central bank continues to be beneficial for all except Mauritius, but the gains for existing CMA members—compared to the existing arrangement—likely would be limited and fall well within plausible margins of error.

By design, the model thus leaves a number of relevant issues outside the scope of this analysis. These include the political factors that may be essential to make currency unions work,² the intrinsic benefits from exchange rate stability—less uncertainty promoting investment and intraregional trade—and the creation of a common money market. In addition, the smooth operation of a common currency area also hinges on building institutions (a central bank, a regional financial supervisor, common accounting standards) and on broader coordination of fiscal, structural, and regulatory policies. The scope of the model thus needs

¹ These estimates are not meant to make precise comparisons among the countries but are intended to provide broad and comprehensive estimates on welfare gains and losses of CMA participation. More precise estimation for each country case would call for capturing more country-specific factors (policymakers' preferences and institutional quality) and detailed measures of financial needs based on data up to 2011.

² Some broader considerations are surveyed in Hawkins and Masson (2003).

to be kept in mind when interpreting the results. Even though the gains are expressed in “welfare” terms, the analysis cannot validate normative statements on its sole merits. For instance, the recent euro area crisis has demonstrated the importance of solidarity and risk sharing among member countries, bringing to the fore fundamental questions about the extent of the loss of sovereignty—and the associated political costs—required for the sustainability of regional monetary unions. Our simulations could not possibly inform that essential debate. Instead, the model provides one useful benchmark that can be used for further evaluation of monetary union proposals along with more traditional OCA-based assessments, and microeconomic analyses of a single currency.

The rest of the paper is structured as follows. Section II reviews the Optimum Currency Area (OCA) literature and previous analyses of the CMA experience. After a quick summary of DMP’s main features (Section III), we turn to the history and institutional arrangement of the CMA and look at the state of economic convergence. We quantify the welfare benefits of the CMA and hypothetical enlargements in Section V. Section VI deals with possible challenges of a Common Monetary Union for the CMA member countries. Concluding remarks form Section VII.

II. LITERATURE REVIEW

The traditional OCA literature discusses the costs of forfeiting monetary policy autonomy and the corresponding importance of alternative adjustment mechanisms for external imbalances. In his pioneering study, Mundell (1961) emphasized labor mobility, as a crucial adjustment mechanism for idiosyncratic shocks, and therefore a key precondition for forming an OCA. Price and wage flexibility were also seen as important for coping with idiosyncratic demand shocks. Because shocks were more likely to be similar among highly integrated economies, McKinnon (1963) suggested the degree of openness—defined as the ratio of tradable to nontradable goods—as a key indicator in forming an OCA. Completing the trilogy of classic OCA studies, Kenen (1969) introduced product diversification as an element of an OCA emphasizing that regions with a highly diversified production base should be better equipped to maintain a currency union than regions with low diversification because the latter were more vulnerable to asymmetric disturbances. In addition, he pointed out fiscal integration among regions as a mitigating factor because of the implied risk sharing.

More recently, the literature extended the basic economic insights from the classical OCA approach to incorporate new dimensions, including the effectiveness and credibility of monetary policy (Beetsma and Bovenberg, 1999), the centrality of shock correlations (Alesina, Barro, and Tenreyro, 2002), and the endogeneity of OCA adequacy.³ While it is generally understood that a higher correlation of shocks between countries makes monetary union more beneficial, Mélitz (1991) shows that even if countries face identical shocks, they might still need different policy responses given different initial economic positions and country-specific transmission mechanisms.

³ Beetsma and Giuliodori (2010) provide a detailed survey on OCA theory and the EMU.

A number of studies suggest that monetary integration may be self-validating, because OCA criteria are endogenous to the creation of a monetary union. Frankel and Rose (1997) argue that openness (degree of integration) and income correlation are linked because the correlation of business cycles across countries depends on trade integration.⁴ Mongelli (2002) qualifies their claim, showing that the endogeneity of OCA criteria depends on the pre-existing degree of convergence. Similarly, De Grauwe and Mongelli (2004) focus on the endogeneity of economic integration, financial integration, symmetry of shocks, and labor market flexibility.⁵

Debrun, Masson and Pattillo (2005) integrate traditional arguments against monetary union—the costs of a one-size-fits-all monetary policy in a heterogeneous region deprived of fiscal federalism—with potential benefits in terms of enhanced policy credibility, by modeling explicitly the substitutability between monetary integration and domestic institutional reforms. They establish the relevance of asymmetries in institutional quality and in the credibility of monetary commitments to macroeconomic stability. In contrast to the OCA literature, they emphasize positive “monetary externalities” associated with larger monetary unions because of the greater gains from monetary coordination and from a more effective separation between monetary and fiscal powers.

The CMA has been the subject of an extensive literature. Van Zyl (2003) discusses the history of monetary integration in Southern Africa and prospects for its extension. Wang and others (2007) review recent developments in the CMA, identify main policy challenges for the members, and discuss implications for further economic integration. Some studies particularly focus on individual countries and their involvements in the CMA (Tjirongo, 1995; Lledo, Martijn, and Gons 2005; Gons 2006; and Dwight 2006). Other papers show that the CMA does not meet the traditional criteria for an optimal currency area, particularly regarding its vulnerability to asymmetric shocks and the degree of labor mobility (Cobham and Robson, 1994; Van der Merwe, 1996; Metzger 2004; and Masson and Pattillo, 2005).

III. THEORETICAL MODEL

The model used in this paper is a variant of Debrun, Masson and Pattillo (2005).⁶ In line with the vast literature on the European Monetary Union, the model focuses on the impact of institutional changes on the credibility of a commitment to low inflation (Beetsma and Bovenberg—1998, 1999; Martin—1995). That approach has considerable appeal in countries and groups of countries where the risks to macroeconomic stability and the need for further credibility-enhancing institutional reforms are high.

⁴ Frankel (1999) notes that the endogeneity of OCA criteria means that some parameters such as openness and income correlation are not irrevocably fixed, but instead they can change over time in response to countries’ fundamental policies and to exogenous factors.

⁵ Blanchard and Wolfers (2000) point out the endogeneity of labor market institutions and Issing (2001) emphasizes the endogeneity of political integration.

⁶ We present the description of the model in Appendix III.

To explicitly model credibility problems and institutional solutions to them, the basic architecture of DMP relies on the positive theory of monetary policy proposed by Barro and Gordon (1983) and extended to fiscal policy issues by Alesina and Tabellini (1987). DMP assumes an n -good, n -country economic area that is small vis-à-vis the rest of the world. Countries differ along various dimensions: size, economic governance (propensity to wasteful public spending), budget flows, and Phillips-curve shocks, which we interpret as terms-of-trade disturbances. As the welfare analysis rests on an explicit characterization of strategic interactions between monetary and fiscal policymakers, the underlying economic structure is essentially static, including a new-classical Phillips curve augmented with a distortionary tax and a negative externality from competitive devaluations (monetary surprises) in trading partners, and simple period-budget constraints—there is no public debt.

The benchmark case for welfare evaluations is a regime of complete monetary policy autonomy (flexible exchange rates) with politically dependent central banks. Monetary and fiscal policies are determined jointly by minimizing deviations of the effective tax rate, public expenditure and inflation from specific objectives. Those objectives are nonnegative constants except for inflation, which fluctuates to partly accommodate Phillips-curve shocks. This captures the preferred trade-off between the variability of inflation and that of output. Finally, as in Barro and Gordon (1983), governments also care about the level of output, welcoming expansions and disliking contractions.

As usual in this literature, equilibrium policies systematically deviate from the first best, reflecting the government penchant for using monetary policy to boost activity beyond its potential—instead of raising the potential through politically costly structural reforms—and the inflationary impact of the waste of tax money levied through distortionary instruments. Overall, inflation is too high and productive public spending too low in comparison to the case in which decision makers could credibly pre-commit.

Monetary unification is modeled as a change of regime in which monetary policy is decided by a regional central bank, whereas fiscal policy remains in national hands. It yields benefits similar to the delegation of monetary policy to an independent central bank. Indeed, a regional monetary policy is less effective at stimulating output in each individual country because there is no gain to expect from a depreciation of the national currency vis-à-vis trading partners in the region. Centralized monetary policy thus brings about lower inflation across the board. In terms of welfare, these credibility gains are proportional to the size of the initial bias (reflecting the slope of the Phillips curve, the reluctance to raise distortionary taxes, the appetite for productive public spending, and the amount of wasteful public spending) and to the intensity of intraregional trade linkages. For instance, little trade implies little loss of effectiveness of the regional monetary policy in comparison to the national policy, and therefore a reduced attenuation of the central bank's incentive to generate excessive inflation. The costs of unification arise from the inadequacy of the regional monetary policy in the face of country-specific shocks, in line with OCA literature.

IV. THE CMA: HISTORY, INSTITUTIONAL ARRANGEMENTS, AND ECONOMIC CONVERGENCE

This section reviews history and institutional features of the CMA. We also look at the state of economic convergence across member countries.

A. History and Institutional Arrangements⁷

Although the CMA arrangement formalizes the regional role of the South African rand as a means of payment, it is not as such a full-fledged currency union. In 1921, after the establishment of the South African Reserve Bank (SARB), the South African currency (initially the pound and since 1961 the rand) effectively became the only medium of exchange and legal tender in South Africa, Bechuanaland (now Botswana), Lesotho, Namibia, and Swaziland. There were no internal restrictions on capital flows within the area, and virtually all external transactions were executed through banks in South Africa and subject to South African exchange controls. This system was maintained after Botswana, Lesotho, and Swaziland gained independence in the 1960s and was institutionalized on December 5, 1974, with the signing of the Rand Monetary Area (RMA) agreement. Botswana left the RMA in 1975 in favor of policy independence.⁸

The RMA was revamped in April 1986 and transformed into the CMA, composed of Lesotho, Swaziland, and South Africa. Under the terms of the CMA Agreement, Lesotho and Swaziland would continue to have the right to issue their own national currencies. Swaziland introduced its currency, the lilangeni, in 1974, followed by Lesotho's loti in 1980. Namibia, which gained independence from South Africa in 1990, formally joined the CMA two years later and launched the Namibian dollar in 1993.

Within the CMA, Lesotho, Namibia, and Swaziland (the LNS countries) have pegged their domestic currencies at par to the South African rand. Bilateral agreements define where currencies are legal tender. While the South African rand is legal tender in all member countries of the CMA, the three other currencies are only legal tender in their own country. The South African Reserve Bank (SARB) has adopted an inflation targeting framework.

In each LNS country, the local currency and the rand are perfect substitutes, with no conversion cost, and no restrictions on funds transfers, whether for current or capital transactions. All four members of the CMA (together with Botswana) belong to the Southern African Customs Union. As a consequence, capital and goods are highly mobile across the CMA region,⁹ although further progress is needed in removing nontariff barriers to trade. In

⁷ Table A.1. in Appendix A.1. summarizes major events in the CMA's development.

⁸ While Botswana left the RMA in 1975, it continued to use the rand until August 1976.

⁹ The only exceptions result from the member countries' investment or prudential liquidity requirements prescribed for financial institutions.

normal times, LNS countries greatly benefit from goods and capital mobility, as this gives them access to South African investments and markets. However, in times of crisis, sharp reversals in net capital flows (moving to South Africa) can strain these smaller economies. This is exacerbated even further by the absence of conversion cost between the local currency and the rand.

Although all CMA countries effectively share the same monetary policy, the CMA is not a full currency union. There is no common central bank conducting monetary policy for the region as a whole and pooling external reserves, and there is no formal regional surveillance of domestic policies to ensure that these remain consistent with a smooth working of the area. The exchange rate arrangements of the smaller countries under the CMA have certain characteristics of a currency board—domestic currency issues are required to be fully backed by foreign reserves (except for Swaziland). However, unlike a typical currency board, there is no restriction for the central bank of a small member country to hold domestic assets. Importantly, the 1-to-1 parities with the rand are not backed by irrevocable commitments such as the promise of mutual assistance in case the peg comes under pressure. The SARB may, however, make foreign exchange available to other members of the CMA. Finally, there are no fiscal transfers aimed at cushioning the impact of asymmetric shocks.

Another peculiarity of the CMA is that unlike other members, Swaziland has the option to adjust its exchange rate unilaterally. Such an adjustment would not require formal consultations with South African authorities.¹⁰ Additionally, Swaziland is not required to hold foreign exchange at the SARB to cover its currency in circulation, like Lesotho and Namibia. The reintroduction of the rand as legal tender was done with the concurrence of the rest of the CMA in 2003.

The long history of monetary association and strong financial and trade linkages explains why the CMA coincides with a free trade area enjoying unrestricted capital mobility. This unique characteristic contrasts with two long standing monetary unions in Africa: the Economic and Monetary Community of Central Africa (CEMAC) and the West African Economic and Monetary Union (WAEMU), where some trade restrictions persist, and intra-regional capital mobility, though in principle free, remains low (Masson and Pattillo, 2001).

B. Economic Convergence

A prominent characteristic of the CMA is the economic and financial weight of South Africa, which accounts for more than 90 percent of the region's GDP and trade. Despite the global financial crisis's impact on growth, fiscal positions remained fairly benign on average in 2008–2010, although Swaziland posted fairly sizeable and increasing deficits (5.6 percent of GDP on average over in 2008–10, with 13.8 percent, on a commitment basis, during the fiscal year 2010/11), while Lesotho's public debt, at 41.5 percent of GDP, stayed well above the regional average.

¹⁰ Should Swaziland decide to adjust exchange rate, it would have to provide a six month notice to the SARB.

Table 1. CMA Countries: Selected Economic Indicators, 2008–2010

(Average, unless otherwise indicated)

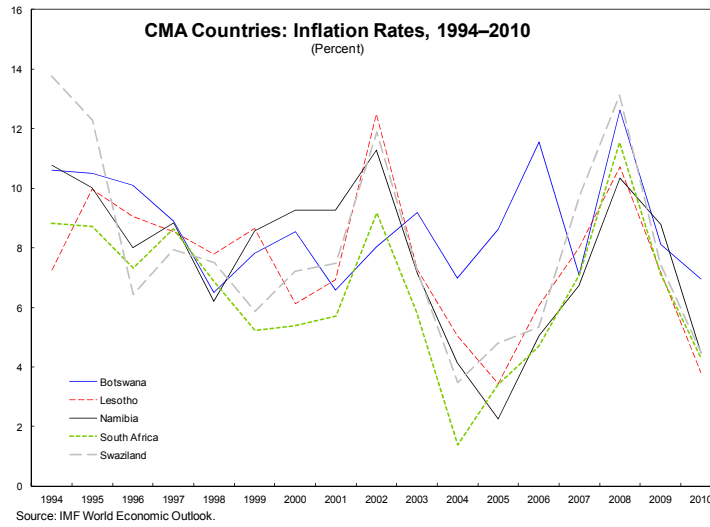
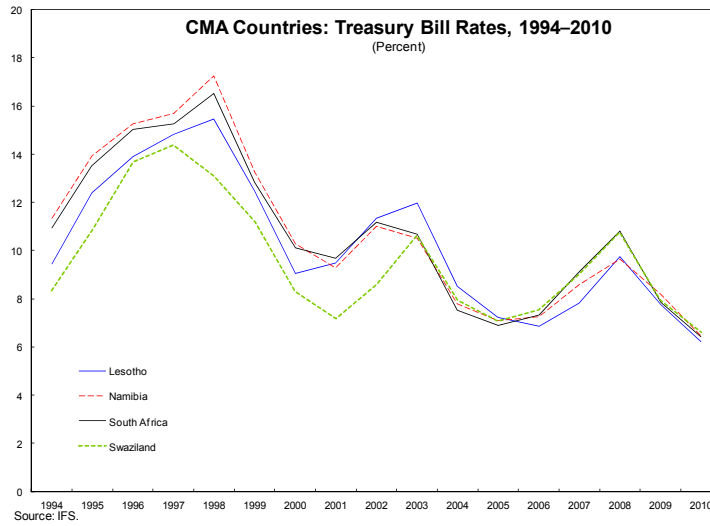
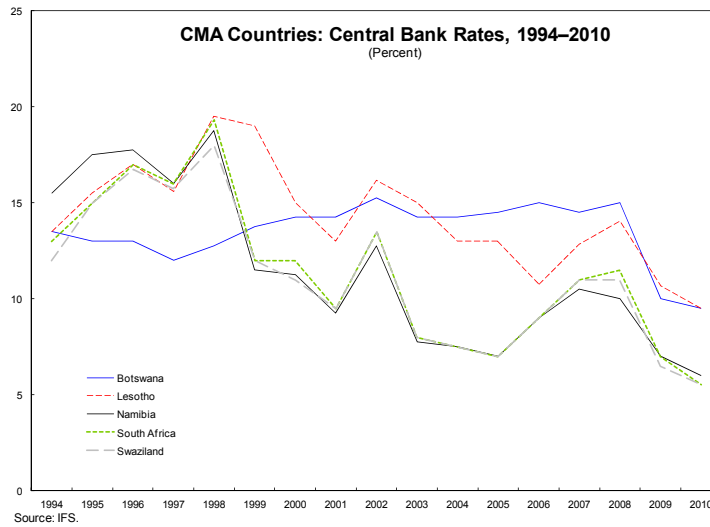
	CMA				CMA Total	<i>Memo. Item</i>
	Lesotho	Namibia	South Africa	Swaziland		Botswana
Nominal GDP (millions of US dollars)	1,939	9,947	307,743	3,167	322,795	13,323
Real GDP growth rate (percent)	3.7	2.8	1.6	2.1	...	1.7
Inflation (percent, period average)	6.6	7.9	7.6	7.3	...	9.2
Fiscal balance (including grants; percent of GDP)	-0.8	-1.9	-3.8	-5.6	...	-8.9
Total government debt (percent of GDP) ¹	41.5	17.6	31.2	16.1	...	12.3
International reserves (months of imports)	5.1	3.8	5.0	3.8	...	19.3
Current account balance (percent of GDP)	-0.8	1.1	-4.7	-13.6	...	-1.3
Total exports (millions of US dollars)	870	4,149	91,840	1,888	98,746	4,757

Source: National authorities and IMF staff estimates.

¹This includes grants.

Pegged exchange rates and perfect intra-regional capital mobility imply that monetary policy rates are bound to move in parallel among CMA countries (Figure 1), with SARB's monetary stance being the area's anchor. Monetary hegemony is indeed the only possible equilibrium in a fixed exchange rate system without formal cooperation procedure to set interest rates in line with CMA-wide conditions. Although discount rates in Namibia and Swaziland have been closely aligned with the SARB repo rate, Lesotho implements monetary policy through the treasury bill market, hence the spread observed with respect to the policy rates of the other members. As a result of monetary policy convergence, the LNS countries benefited from South Africa's largely successful adoption of a formal inflation-targeting framework in 2001. The convergence of inflation rates across the CMA supports the view that the area effectively functions as a currency union under the leadership of the SARB.

Figure 1. CMA Countries and Botswana: Central Bank Rates, Treasury Bill Rates, and Inflation Rates



In the absence of CMA-wide benchmarks on external reserves, the deterioration of fiscal balances in the aftermath of the global financial crisis may raise concerns about reserve adequacy. However, conventional reserve adequacy indicators are not alarming. In terms of import coverage, international reserves in LNS countries remained close to 3 months.¹¹ That said, because the credibility of fixed parities can always be tested, reserve levels can be usefully compared to the size of base money and broad money aggregates, as is routinely done when assessing reserve adequacy in currency boards. Table 2 shows that Lesotho has maintained a relatively high level of reserves to cover broad money in the past three years, but the ratio declined sharply in 2011. The situation in Swaziland is less benign, with reserves covering slightly less than half of broad money in 2011, which is a dramatic deterioration since 2008. Although Namibia exhibited much lower reserve coverage ratios of broad money—a reflection of its more developed financial sector—reserves largely exceed short-term external debt (an indicator not available for Lesotho and Swaziland), suggesting that reserves would not come under immediate pressure in case of a sudden stop in capital inflows.

Table 2. Small CMA Countries: Reserve Adequacy Ratios

	2008	2009	2010	2011 Est.
	(Months of imports)			
Gross reserves/imports				
Lesotho	6.0	5.6	3.8	2.6
Namibia	3.8	4.7	2.8	2.5
Swaziland	4.6	3.9	2.8	2.3
	(Percent)			
Gross reserves/short-term external debt				
Lesotho	n.a.	n.a.	n.a.	n.a.
Namibia	403	908	599	591
Swaziland	n.a.	n.a.	n.a.	n.a.
Gross reserves/base money ¹				
Lesotho	939	844	670	510
Namibia	542	636	312	274
Swaziland	749	496	384	237
Gross reserves/broad money				
Lesotho	155	132	104	67
Namibia	39	53	29	25
Swaziland	116	84	54	48

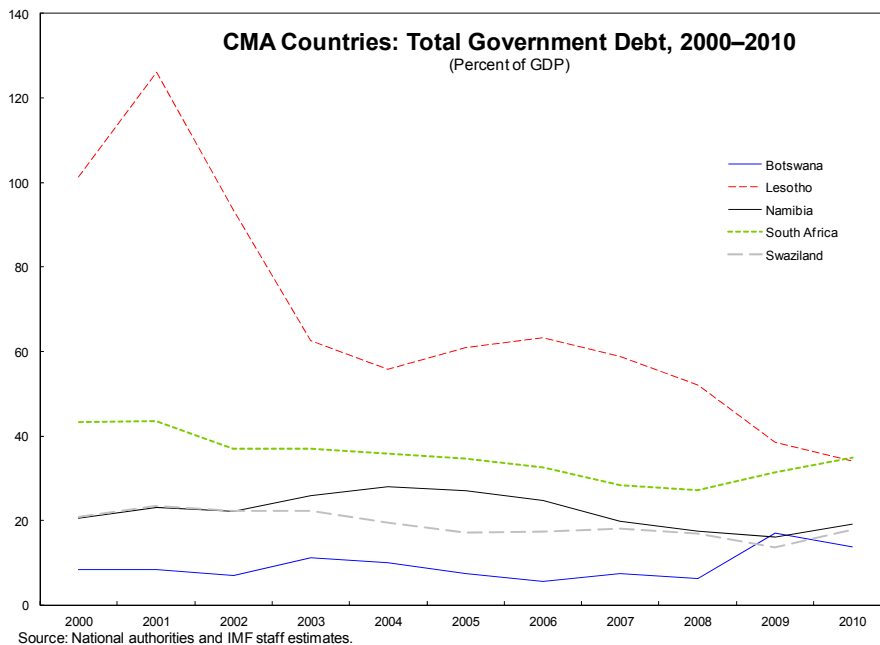
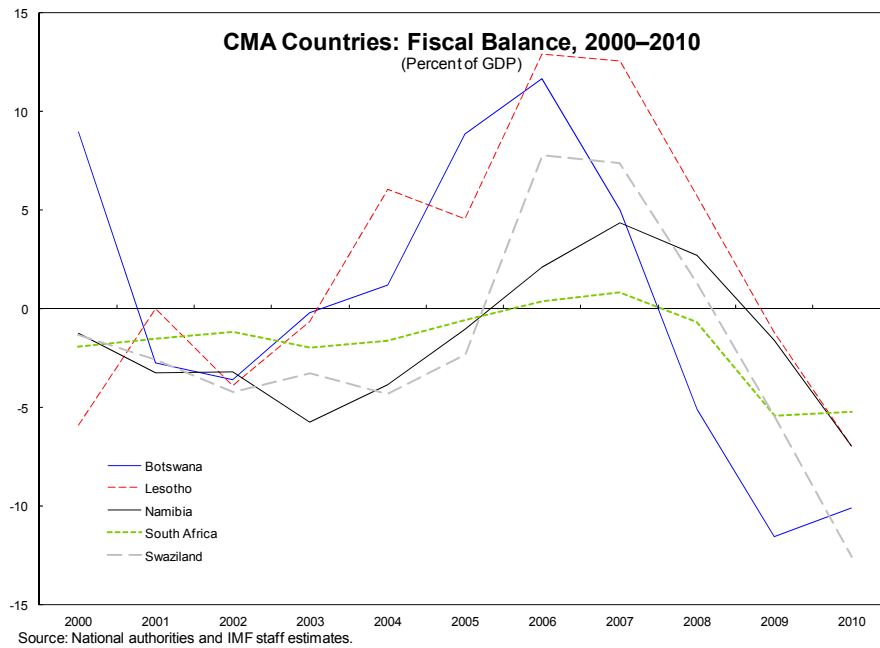
Source: National authorities and IMF staff estimates.

¹Rand circulation is not included as part of base money.

¹¹ IMF (2011) cautions against a uniform metric for reserve adequacy – including the traditional rules of thumb – across all LICs. In particular, the quality of overall policy framework should play a role in the determination of optimal reserve levels.

Although the global crisis led to a synchronized deterioration of fiscal balances in the CMA and to some convergence, LNS countries' fiscal positions are more volatile than South Africa's mostly owing to these countries' smaller size and lack of diversification. The SACU revenue-sharing formula also contributed to the volatility of fiscal positions, as shown by considerable differences during cyclical upturns, such as in 2004–07, when LNS countries recorded much larger surpluses than South Africa (Figure 2). This allowed them to maintain low and relatively stable public debt levels and, in the case of Lesotho, to gradually converge to the 20–40 percent of GDP range.

Figure 2. CMA Countries and Botswana: Fiscal Balance and Total Government Debt



V. MODEL-BASED ASSESSMENTS OF THE COMMON MONETARY AREA AND VARIANTS OF IT

Is CMA participation in the best interest of its members? The DMP model can provide some elements of an answer, comparing the costs of sharing a single monetary policy in terms of foregone stabilization with the benefits of the policy coordination brought about by fixed exchange rates. As indicated earlier, welfare effects are calculated as deviations from a hypothetical counterfactual where each country could set its own monetary policy to maximize a weighted average of national policy objectives. This implicitly assumes that nominal exchange rates would be allowed to fluctuate and to be a key transmission channel of monetary policy. However, the specific costs related to exchange rate volatility and risk are not captured by the model. We first look at the CMA as it is and then explore the implications of other SADC member states joining the area. We selected these exercises for their illustrative virtues, deliberately abstracting from other relevant dimensions of integration. Finally, we estimate the impact of establishing a regional central bank where each member state would influence the common monetary policy proportionally to its economic size.

A. The CMA

On the cost side, what matters are the correlations of LNS countries terms-of-trade shocks with South Africa's: the lower the correlation for a given country, the greater the cost entailed by the absence of monetary sovereignty. On the benefit side, the model emphasizes two key elements. The first is the intensity of intraregional trade flows. The greater they are, the greater is the externality related to noncoordinated monetary policies (for instance, leading to competitive devaluations). A monetary union shuts off this transmission channel of monetary policy, which in turn prevents a common central bank (CCB) from exploiting monetary policy to boost output in one country at the expense of the others.¹² The CCB therefore enjoys greater anti-inflationary credibility than a purely national institution. In addition, the CCB can more easily deflect pressures from individual member states to provide monetary financing for the budget. Note that model simulations assume an allocation of seigniorage and inflation tax revenues according to GDP shares. The seigniorage differs from the rules-based allocation under the current CMA framework. In practice, however, the induced discrepancies between the formula-based and the GDP-share revenue are too small (about ½ percentage point of GDP for Lesotho for instance) to be significant for our welfare comparisons.¹³

To account for the leadership role of the SARB in setting the area-wide monetary stance, we calibrate the CCB such that LNS countries have no influence. In this scenario, our

¹² In this paper, we consider two cases: (i) the SARB chooses monetary policy for the whole area, and (ii) a CCB weighs the welfare of South Africa and LNS countries proportionally to their economic size.

¹³ Pastor and Ramirez (2012) find that in terms of international comparisons, the revenues from seigniorage in the CMA countries and Botswana is less than one fourth of what generally accrues to governments in countries with similar rates of inflation.

hypothetical SARB has no incentive to seek competitive devaluations vis-à-vis other CMA countries, which lowers the credible inflation rate, but it is not better insulated from eventual pressures to raise the inflation tax than if it sets monetary policy only for South Africa. Likewise, LNS central banks boost their anti-inflationary credibility because they cannot use devaluations in a strategic fashion. In addition, the CMA arrangement—assuming it is in itself fully credible—perfectly insulates local monetary conditions from LNS budget financing considerations. For them, CMA membership thus represents a powerful tool to cement their commitment to price stability.

Key inputs for model simulations are summarized in Table 3. Low terms-of-trade correlations of LNS countries with South Africa and generally more volatile terms of trade point to non-negligible costs related to the absence of monetary sovereignty for these countries. At the same time, the LNS countries are generally more open to trade¹⁴—notably with South Africa—and have larger “financing needs” from the budget, suggesting that gains in terms of anti-inflationary credibility are likely to be large.

Table 3. CMA Countries: Key Model Inputs, 1994–2010

	TOT Correlations with South Africa	FN ¹	Standard Deviation of TOT shocks	Openness: 0.5(X+M)/GDP	Adjusted Standard Deviation of TOT
<i>CMA members</i>					
Lesotho	28.17	66.55	2.42	76.55	1.85
Namibia	20.52	41.55	3.83	45.28	1.73
South Africa	100.00	33.34	1.43	27.34	0.39
Swaziland	9.32	44.43	2.78	81.73	2.27
<i>Memo. Item</i>					
Botswana	36.06	42.17	3.95	42.83	1.69

Source: Authors' calculations.

¹FN stands for financing need. That concept estimates the resources required to finance the socially-optimal level of productive (welfare-generating) public spending. FN therefore combines measures of the desired level of productive public spending and waste. The methodology to capture these unobservable variables is discussed in Debrun, Masson and Pattillo (2011). Underlying data reflect 1994–2005 averages to exclude the large changes in fiscal variables observed around the crisis.

As anticipated, the costs arising from shock asymmetry are meaningful: a permanent decline of per capita income equal to 0.3 to 0.5 percent. Because the CCB/SARB now sees monetary policy as less effective than if exchange rates with LNS countries were floating, the inflationary bias inherent in its incentive to stimulate production beyond potential is smaller. The overall welfare effect from the monetary externality is by construction the same (0.46 percent) for all countries; and with the exception of Swaziland, it is large enough to offset the costs of a one-size-fits-all monetary policy. For South Africa, the anchor of the CMA, this credibility effect is in fact the only determinant of net gain because the equilibrium inflation

¹⁴ The model simulations reflect trade intensities from a bilateral trade matrix using the IMF Direction of Trade Statistics.

tax and response to shocks are the same as under monetary sovereignty. LNS countries can count on a third, and quantitatively much larger, benefit: a credible CMA arrangement insulates their central banks from the pressure to finance strained budgets by raising the inflation tax. The magnitude of the gains—in the range of 2 to 6 percent in permanent per capita income—reflects the very high equilibrium inflation tax rates found by the model under the assumption of monetary sovereignty. This is rooted in a greater estimated appetite for public spending and weaker economic governance (and heightened likelihood of waste). For instance, the model estimates that Lesotho’s financing need is twice as large as South Africa’s (last column of Table 4). Overall, the model’s estimates of the permanent per capita income gains owing to the CMA are significant: 6.1 percent for Lesotho, 2.1 percent for Swaziland, 1.8 percent for Namibia, and South Africa at 0.5 percent.

Table 4. CMA: Welfare Gains and Losses¹

	Welfare Gain	Due to :			GDP share ²	Shock correlation ³	FNA/FN ³
		Monetary Externality	Fiscal Asymmetry	Shock Asymmetry			
Lesotho	6.07	0.46	6.03	-0.31	0.57	28.17	50.10
Namibia	1.79	0.46	1.64	-0.28	2.62	20.52	80.25
South Africa	0.46	0.46	0.00	0.00	95.75	100.00	100.00
Swaziland	2.11	0.46	2.19	-0.51	1.05	9.32	75.04

Source: DMP simulations.

¹We assume that South Africa sets monetary policy for the CMA.

²In percent.

³Compared to South Africa's terms of trade shock and financing need, respectively, in percent.

B. Hypothetical Expansions of the Common Monetary Area

A natural question at this stage is whether expanding the membership of a mutually beneficial arrangement such as the CMA would make sense both for existing members and potential newcomers. For illustrative purposes, we select the universe of potential newcomers among countries of the SADC member states—with the exceptions of Seychelles and Madagascar because of gaps in data. The main interest of the SADC as the focus of our simulations is that it is a large and heterogeneous club to which all CMA countries belong. While the SADC has plans to put in place a monetary union, the horizon is distant and subject to considerable uncertainty.¹⁵ Moreover, one of its members, Tanzania, has already committed to participate in a monetary union with other members of the East African Community, whereas Botswana has shown no interest in joining a monetary union. To shed light on the strategic dimension of integration, we proceed in two steps: first, we expand the existing CMA one country at a time and assess the welfare impact; second, we introduce potential members all at once.

¹⁵ The plan is outlined in the Regional Indicative Strategic Development Plan (RISDP). It envisages a common market by 2015 and a common currency by 2018.

Adding a single country to the existing CMA: who gains, who loses?

The SADC forms a large and diverse group of countries. However, even in this broader area, South Africa's economy is larger by far than all the others combined (it still makes up more than 70 percent of the community's GDP). As Table 5 illustrates, countries differ widely in the key dimensions of our model: terms-of-trade correlations and volatilities, government financing needs, and intensities of intraregional trade linkages. Given the results above, one could again expect that financing needs will ultimately shape a given country's willingness to join and the existing CMA members' incentive to welcome it. The very large dispersion of financing needs reflects highly heterogeneous institutional environments. Tanzania and all CMA members except Lesotho have relatively low financing needs, in sharp contrast with Angola, Lesotho, and Zimbabwe. Correlations of terms-of-trade shocks are generally low or negative, again pointing to significant costs of monetary unification, when compared to the hypothetical benchmark case of monetary sovereignty. In other words, if one were to rely exclusively on OCA criteria to analyze the desirability of a larger CMA, one would be likely to dismiss the case out of hand.

Table 5. SADC Countries: Selected Indicators, 1994–2010

	TOT correlations with South Africa	FN ¹	Standard deviation of TOT shocks	Openness: 0.5(X+M)/GD P	Adjusted standard deviation of TOT
<i>CMA members</i>					
Lesotho	28.17	66.55	2.42	76.55	1.85
Namibia	20.52	41.55	3.83	45.28	1.73
South Africa	100.00	33.34	1.43	27.34	0.39
Swaziland	9.32	44.43	2.78	81.73	2.27
<i>Other SADC Members</i>					
Angola	-0.84	57.79	10.08	72.51	7.31
Botswana	36.06	42.17	3.95	42.83	1.69
Congo, D. R.	24.25	37.56	5.86	35.38	2.07
Malawi	-25.55	46.71	9.54	34.83	3.32
Mauritius	-18.49	27.58	7.31	58.81	4.30
Mozambique	28.03	42.58	2.42	32.57	0.79
Seychelles	14.48		10.29	85.35	8.78
Tanzania	-32.52	31.06	5.29	23.08	1.22
Zambia ²	28.09	46.58	7.55	36.43	2.75
Zimbabwe ³	-25.30	52.14	2.37	39.50	0.94

Source: Authors' estimates.

Note: Seychelles is omitted from our calculations because its high per capita income gives implausible figures for its FN variable.

¹Data from 1994–2005

²Data from 1999–2010.

³Data from 1999–2007.

A number of interesting results emerge from the exercise (Tables 6). First, all CMA members appear to benefit—albeit marginally in many cases—from the membership of any other individual SADC country provided the SARB continues to set monetary policy for the

enlarged CMA. Second, three potential candidates to CMA membership would lose out from joining on their own initiative: Angola, Mauritius, and Tanzania. These three countries would clearly suffer from having to adopt South Africa's monetary policy because their terms of trade shocks are orthogonal to or negatively correlated with South Africa's. In Angola and Mauritius, terms of trade are also extremely volatile, making a national monetary policy desirable. These are prominent cases where OCA arguments dominate credibility considerations. For Mauritius—and to a lesser extent, Tanzania—the loss would be aggravated by the likelihood that the CMA-wide inflation tax would exceed what the model describes as optimally required to cover their relatively low financing needs.

The greatest winners among potential new entrants would be Botswana,¹⁶ Zambia, and Zimbabwe.¹⁷ All three countries would benefit significantly from a lower inflation rate mainly owing to reduced fiscal pressures on monetary policy. In Botswana and Zambia, positive terms-of-trade correlations also help contain the costs from no longer having their own monetary policy to stabilize output in the face of shocks. These hypothetical gains and losses also depend importantly on the estimated financing needs. These can change over time as countries adopt fiscal reforms relieving pressures on its monetary policy. Conversely South Africa, the anchor for the CMA, could see its finances deteriorate to the point of nullifying the hypothetical gains for other countries that are calculated here.

¹⁶ For Botswana, the largest component of welfare gains is due to the fiscal asymmetry (1.76 percent of GDP) with moderate gains owing to monetary externality (0.79 percent) offset only partially by the welfare loss associated with asymmetry in terms-of-trade shocks (0.25 percent).

¹⁷ Kramarenko and others (2010) review pros and cons of alternative monetary regimes for Zimbabwe, including the possibility of joining the CMA. They also provide welfare analysis of Zimbabwe's participation in the CMA and predict that existing members' welfare would fall marginally by about $\frac{1}{3}$ percent of CMA GDP. Zimbabwe, however, would gain more than 24 percent of GDP with most of the gain stemming from the fiscal externality. Differences between the current results and previous ones are due to significant reduction in the estimated financing needs of Zimbabwe, which reduces the necessary inflation tax.

Table 6. Welfare Gains or Losses from Adding A Single SADC Country to the CMA¹
(Percent of GDP)

	Angola	Botswana	Congo, DR	Malawi	Mauritius	Mozambique	Tanzania	Zambia	Zimbabwe
Lesotho	0.02	0.25	0.02	0.05	0.05	0.09	0.01	0.08	0.2
Namibia	0.03	0.31	0.03	0.06	0.06	0.11	0.01	0.1	0.25
South Africa	0.03	0.33	0.03	0.06	0.07	0.12	0.02	0.1	0.26
Swaziland	0.03	0.31	0.03	0.06	0.06	0.11	0.01	0.1	0.24
Angola	-0.29								
Botswana		2.25							
Congo, DR			0.93						
Malawi				1.92					
Mauritius					-2.56				
Mozambique						2.32			
Tanzania							-0.18		
Zambia								2.4	
Zimbabwe									4.11

Source: DMP simulations.

¹Monetary policy is assumed set by South Africa. Welfare is relative to monetary autonomy for new entrants, relative to CMA for CMA members.

²The Zimbabwe exercise is based on data up to 2007, and as a result, the estimated gains owing to low inflation rate from participating the CMA are measured relative to the monetary policy pursued before dollarization in 2009. As of today, benefits from low inflation would be smaller with unchanged moderate gains due to monetary externality if Zimbabwe were to join the CMA.

Expanding the common monetary area arrangement to all SADC countries

The logic of the DMP model suggests that a block expansion could be more desirable than a piecemeal monetary integration. To illustrate that property of the model, the results in Table 7 indicate that only Mauritius would remain a net loser from CMA membership, essentially for the same reasons as above. For Angola and Tanzania, notably, joining the CMA with all other SADC countries at the same time would yield net benefits, while joining the CMA alone would not. As the decomposition of welfare effects shows, the game changer between the two integration strategies is that the credibility effect associated with a single monetary policy is quite sizable (in excess of 1.3 percent of permanent per capita consumption for SADC candidates and about 0.9 percent for existing CMA members).

Table 7. A Greater CMA/SADC: Welfare Gains and Losses¹
(Percent of GDP)

	Welfare Gain	Due to :			GDP share ²	Shock correlation ³	FNA/FN ³
		Monetary Externality	Fiscal Asymmetry	Shock Asymmetry			
Angola	0.42	1.35	4.59	-5.29	5.07	-0.84	57.7
Botswana	2.77	1.35	1.76	-0.25	2.99	36.06	79.07
Congo, Dem. Rep.	1.77	1.35	0.85	-0.4	2.68	24.25	88.76
Lesotho	0.68	0.89	0	0	0.43	28.17	50.1
Malawi	2.67	1.35	2.62	-1.17	0.97	-25.55	71.38
Mauritius	-1.7	1.35	-1.21	-1.9	0.62	-18.49	120.91
Mozambique	3.04	1.35	1.84	-0.06	1.95	28.03	78.3
Namibia	0.84	0.89	0	0	1.96	20.52	80.25
South Africa	0.89	0.89	0	0	71.61	100	100
Swaziland	0.92	0.89	0	0	0.79	9.32	75.04
Tanzania	0.71	1.35	-0.47	-0.19	4.54	-32.52	107.33
Zambia	3.12	1.35	2.59	-0.7	1.88	28.09	71.58
Zimbabwe	4.66	1.35	3.61	-0.12	4.52	-25.3	63.95

Source: DMP simulations.

¹South Africa is assumed to set monetary policy. Welfare is relative to monetary autonomy for new entrants, and to CMA for existing members.

²In percent.

³With respect to the union's average shocks and Financing Need (FNA), respectively, in percent.

VI. HEGEMONY VERSUS A REGIONAL CENTRAL BANK

So far, we have assumed that the CMA monetary policy would continue to be determined by the current rules of the game, giving the SARB explicit monetary hegemony. However, as integration proceeds, the commitment to a regional monetary union could be further cemented by the establishment of a regional central bank in which each member would have a voice. Especially, we simulate scenarios in which a regional central bank sets the common monetary policy to maximize a weighted average of individual welfare functions, using country shares of regional GDP as weights. We first quantify the welfare impact on existing CMA members to move toward such a model, and then we revisit the effect of a regional CCB in the context of the larger SADC currency union.

A. A Full Common Monetary Union with Current Members

The simulations reported in Table 8 suggest that under the current calibration of the model—which reflects past data—no CMA member would benefit from a CCB replacing the SARB. The gains in terms of a more stabilizing monetary policy for LNS countries would be more than offset by LNS governments' pressures on the CCB to raise the inflation tax. By definition, there could not be any additional gain in terms of policy coordination because exchange rates are already fixed. Admittedly, these effects are very small and fall well within reasonable margins of error related to the uncertainty surrounding the model's calibration. The overwhelming influence of South Africa's economic conditions on the region is such that there would arguably be little difference between the current, explicitly hegemonic model and a regional CCB. Moreover, that particular comparison can be sensitive to some limitations of the model. As mentioned earlier, the DMP framework does not capture some potential benefits of establishing a monetary union, including the complete elimination of currency risk and the greater induced convergence of nominal interest rates. Also, specific

guarantees on the political independence of the CCB could better insulate it from the influence of fiscally profligate countries and could conceivably be a precondition imposed by the anchor of a fixed exchange rate system before moving to a full-fledged monetary union (Debrun, 2001).

Table 8. Welfare Effect of a CMA Monetary Union Versus Existing Arrangement¹
(Percent of GDP)

	Welfare Gain	Due to :			GDP share ²	Shock correlation ³	FNA/FN ³
		Monetary Externality	Fiscal Asymmetry	Shock Asymmetry			
Lesotho	-0.08	0.00	-0.08	0.00	0.57	27.19	50.89
Namibia	-0.08	0.00	-0.10	0.01	2.62	31.58	81.50
South Africa	-0.11	0.00	-0.11	0.00	95.75	99.19	101.56
Swaziland	-0.09	0.00	-0.10	0.01	1.05	14.78	76.21

Source: DMP simulations.

¹South Africa sets monetary policy for the existing CMA.

²In percent.

³With respect to the union's average shock and Financing Need (FNA), respectively, in percent.

B. A Larger Currency Union with SADC Members

The set of net beneficiaries of a larger SADC currency union under a regional CCB is the same as if SARB maintained its leadership position: only Mauritius would have no interest in joining the union. Quantitatively, however, a SADC union with a regional central bank would spread the losses from a one-size-fits-all monetary policy across virtually all countries, confirming that the SADC is not an OCA in the traditional sense. Also, existing CMA members would lose out from the larger inflation tax imposed by the participation of the more profligate members of the SADC. The net result is that current CMA members would gain little, if anything, from a larger SADC currency union under a regional central bank.

Table 9. A Larger SADC Currency Union¹
(Percent of GDP)

	Welfare Gain	Due to :			GDP share ²	Shock correlation ³	FNA/FN ³
		Monetary Externality	Fiscal Asymmetry	Shock Asymmetry			
Angola	0.44	1.35	4.03	-4.74	5.07	77.18	63.36
Botswana	2.18	1.35	1.12	-0.23	2.99	43.46	86.83
Congo, Dem. Rep.	1.15	1.35	0.19	-0.39	2.68	27.52	97.48
Lesotho	0.18	0.89	-0.52	-0.01	0.43	24.81	55.02
Malawi	2.13	1.35	2.00	-1.13	0.97	-3.34	78.39
Mauritius	-2.34	1.35	-1.91	-1.87	0.62	-4.51	132.78
Mozambique	2.45	1.35	1.20	-0.04	1.95	54.02	85.99
Namibia	0.25	0.89	-0.64	0.02	1.96	33.91	88.12
South Africa	0.23	0.89	-0.68	-0.02	71.61	58.82	109.82
Swaziland	0.14	0.89	-0.63	-0.08	0.79	-26.95	82.41
Tanzania	0.05	1.35	-1.16	-0.19	4.54	-16.75	117.87
Zambia	2.59	1.35	1.97	-0.64	1.88	47.28	78.61
Zimbabwe	4.08	1.35	3.02	-0.14	4.52	-31.19	70.23

Source: DMP simulations.

¹Relative to monetary autonomy for new entrants, relative to asymmetric CMA for CMA members.

²In percent.

³With respect to the union's average shock and Financing Need (FNA), respectively, in percent.

VII. CONCLUDING REMARKS

Model simulations shed new light on incentives to form currency unions where central banks internalize government budget constraint, pointing to three broad policy implications:¹⁸

(i) In line with the traditional OCA literature, DMP simulations suggest the costs of a one-size-fits-all monetary policy can be significant if external shocks affecting individual economies are large and uncorrelated with the rest of the region (e.g., Bayoumi and Ostry, 1997). The model suggests that CMA countries thus benefit from their monetary association because it provides large offsetting gains in terms of policy credibility and macroeconomic stability.

(ii) While the model captures the value of a rand anchor for the CMA, a regional CCB conducting policy on the basis of area-wide averages would still appear more beneficial than full monetary autonomy. This shows that regardless of specific institutional guarantees on the independence of the CCB, monetary unification in itself can deliver major credibility gains. By the same token, moving toward a regional CCB would likely require such guarantees to be preferred to the existing arrangement by all parties.

(iii) Mechanisms alleviating the costs of currency unions in terms of shock stabilization could help, particularly in an expansion of the CMA. In scenarios explored above, shock

¹⁸ De Cecco and Giovannini (1989) and Kenen (1995) discuss necessary policy suggestions toward the monetary unification in Europe.

asymmetry—which makes the union-wide monetary policy inadequate—can be quite costly in some cases, pointing to the importance of more countercyclical fiscal policies and ultimately, effective risk-sharing mechanisms. Agreeing to and implementing an effective transfer system would pose important challenges for a heterogeneous group of countries like SADC; however, these issues are beyond the scope of this paper.

The simulations further suggest that the current monetary arrangement is beneficial for all CMA members, including South Africa. Lesotho and Swaziland gain the most, because the CMA insulates their monetary policy from fiscal pressures. The potential gains of expanding the CMA to SADC countries depend on the strategy. If current SADC countries were to join the CMA together, all of them except Mauritius could be better off. However, Angola, Mauritius, and Tanzania would lose out from individual membership because Angola is subject to large idiosyncratic disturbances, and Mauritius and Tanzania already have strong fiscal policies.

The creation of a genuine CMA-wide monetary union with a regional central bank carries some costs in terms of foregone anti-inflationary credibility, because the model assumes that fiscally profligate countries could have some influence over monetary policy and extract a marginally higher inflation tax. All members would therefore be better off maintaining the current CMA regime. Furthermore, if this monetary union were enlarged to an SADC-wide one with a regional central bank, all members except Mauritius would benefit. The gains for existing CMA members, however—compared to the existing arrangement—are likely to be negligible, falling well within plausible margins of error.

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Appendix I. History of the Common Monetary Area

Table A.1. CMA: Major Events in History

Year	
1974	Lesotho, South Africa, and Swaziland signed the Rand Monetary Area (RMA) treaty. Swaziland established a monetary authority and issued its own national currency, the lilangeni, pegged at par to the rand. Botswana did not sign the RMA agreement: it had withdrawn from the negotiations in September.
1975–76	Botswana established a central bank, and replaced the rand at par with its own national currency, the pula.
1980	Lesotho established a central bank and issued its own national currency, the loti, pegged at par with the rand.
1986	South Africa, Lesotho, and Swaziland signed the Common Monetary Area Trilateral Agreement to replace the RMA, making additional provisions regarding the capital account, intra-CMA fund transfers, and seigniorage compensation. Swaziland discontinued the use of the rand as legal tender alongside the lilangeni.
1989	The CMA was amended, removing exchange restrictions resulting from limitations on conversion of balances upon termination of the monetary agreement or the withdrawal of one party.
1992	Following its independence from South Africa, Namibia formally joined the CMA. The Multilateral Agreement replaced the Trilateral Agreement.
1993	Namibia initiated issuing its own national currency, the dollar, pegged at par to the rand.
2003	Swaziland reauthorized use of the rand as legal tender.

Appendix II. Institutional Framework of the Common Monetary Area

Wang and others (2007) provide a comprehensive summary of the institutional framework of the CMA:

Currency Arrangement. Article 2 of the CMA (Multilateral) Arrangement gives the three small member countries the right to issue national currencies, and their bilateral agreements with South Africa define the areas where their currencies are legal tender. The local currencies issued by the three members are legal tender only in their own countries. The South African rand, however, is legal tender throughout the CMA.¹ The bilateral agreements also require the LNS countries to permit authorized dealers within their territories to convert, at par, notes issued by their central banks or the South African Reserve Bank without restriction and subject only to normal handling charges.

Under the Lesotho-South Africa and Namibia-South Africa bilateral agreements, the central banks of Lesotho and Namibia are required to maintain foreign reserves at least equivalent to the total amount of local currencies they issue.² Such reserves may comprise the central bank's holdings of rand balances, the rand currency the central bank holds in a Special Rand Deposit Account with the SARB, South African government stock (up to a certain proportion of total reserves), and investments in the Corporation for Public Deposit in South Africa.

Movements of Funds Within the CMA. Under the terms of the CMA Agreement (Article 3), no restrictions can be imposed on the transfer of funds, whether for current or capital transactions, to or from any member country. The only exceptions result from the member countries' investment or liquidity requirements prescribed for financial institutions. The small member countries view investment and liquidity requirements as a measure of savings mobilization for development purposes. The regulations requiring the investment of funds by financial institutions in domestic securities or credits to local businesses or individuals are, in effect, minimum local asset requirements. These regulations are meant to address the concern of the three small, less developed, CMA members that funds generated in their territories and deposited with local financial institutions tended to flow to the more developed capital markets of South Africa.

Access to South African Financial Markets. The CMA Agreement provides for the three small member countries to have access to the South African capital and money markets, but only through prescribed investments or approved securities that can be held by financial institutions in South Africa, in accordance with prudential regulations in the LNS countries. The terms and timing of such issues are subject to consultation and agreement with the South

¹ Swaziland suspended the use of rand as legal tender in 1986 despite the fact that the rand continued to be widely accepted in the country. In the fall of 2003, the Swazi authorities re-authorized the use of the rand as legal tender alongside the lilangeni.

² This provision was not included in the Swaziland-South Africa bilateral agreement of April 1986, in part for reasons detailed in the previous footnote. However, the Central Bank of Swaziland (CBS) has maintained foreign reserves larger than the total amount of local currencies it issued throughout the past two decades.

African government, and the issues have the same rating as South African municipal bonds. As for the short-term money market, no regular arrangements exist for the taking up in South Africa of treasury bills issued by the LNS countries. However, the CMA Agreement recognizes the right of the other member countries, in special circumstances, to enter into bilateral negotiations with South Africa to obtain temporary central bank credit.

Gold and Foreign Exchange Transactions. Although the LNS countries have the right to authorize foreign transactions of local origin and are responsible for doing so, the CMA Agreement (Article 5) requires their exchange control regulations to be – in all material aspects – similar to those in effect in South Africa. Gold and foreign exchange receipts of residents are subject to a surrender requirement. There are no exchange restrictions on current international transactions and for nonresidents.

Compensation Payments. Because the rand is legal tender in all CMA countries (but the currencies of the three small CMA members are not legal tender in South Africa), South Africa compensates them for forgone seigniorage. Compensation is based on a formula equal to the products of (i) two-thirds of the annual yield on the most recently issued long-term South African government stock, and (ii) the volume of rand estimated to be in circulation in the member country concerned. The ratio of two-thirds was established on the assumption that it approximated the yield of a portfolio of reserve assets comprising both long-term and short-term maturities, assuming that the average yield would be less than the full long-term yield.

Consultation and other Provisions. To facilitate implementation of the CMA Agreement, the member countries have established a commission in which each of them has one representative (along with advisors as needed). The commission holds regular consultations – at least once a year – with the aim of reconciling the interests of member countries on common issues pertaining to monetary and foreign exchange policies. It also convenes at other times at the request of a member country. Article 9 of the CMA Agreement provides for the establishment of a tribunal to arbitrate disputes that might arise between member countries regarding the interpretation or application of the agreement.

Appendix III. Description of the DMP Model

National policy-making	
Phillips curve with regional spillovers	$y_i = y_N + c(\pi_i - \pi_i^e - \tau_i) - \sum_{k \neq i, k=1}^n \theta_{i,k} c(\pi_k - \pi_k^e) + \varepsilon_i, \quad i = 1, \dots, n \quad (1)$
Government budget constraint (no debt)	$g_i = \bar{\rho}_i + \mu \pi_i + \tau_i - \delta_i, \quad (2)$
Government's utility function	$U_i^G = \frac{1}{2} \left\{ -a(\pi_i - \tilde{\pi}_i)^2 - b\tau_i^2 - \gamma(g_i - \tilde{g}_i)^2 \right\} + y_i, \quad (3)$
Trade-off between output and inflation variability	$\tilde{\pi}_i = -\eta \varepsilon_i \quad \text{with } \eta > 0 \quad (4)$
Supranational monetary policy	
Phillips curve faced by the common central bank for each member of M	$y_i = y_N + c(1 - \theta_i^M)(\pi_M - \pi_M^e) - c\tau_i - \sum_{k \in M} \theta_{i,k} c(\pi_k - \pi_k^e) + \varepsilon_i, \quad (1')$ $\forall i \in M, \quad \text{with } \theta_i^M = \sum_{k \in M} \theta_{i,k}.$
Key variables and parameters	
π_i	Inflation rate in country i . A superscript “ e ” designates a rationally expected value.
y_i	Logarithm of output in country i .
y_N	Logarithm of the natural level of output at zero taxation. Without loss of generality, we assume $y_N = 0$.
τ_i	Corporate income tax rate (also tax revenues in percent of output).
$\theta_{i,k}$	Marginal effect of monetary policy in country k on output in country i .
ε_i	Terms of trade shock (zero-mean, transitory, and with finite variance).
g_i	Socially beneficial government expenditure in percent of output.
μ	Inflation tax base in percent of output.
$\bar{\rho}_i$	Permanent non-tax revenue from natural resource endowment in percent of output.
δ_i	Funds diverted from socially beneficial government expenditure in percent of output.
η	Relative preference for output stability against inflation stability.

Note: complete solutions are available from the authors upon request.

Inflation Rates Under Alternative Monetary Regimes

Monetary Regime	Equilibrium Inflation (country i)
Autonomy	
<i>The equilibrium (time-consistent) inflation is...</i>	$\pi_i^* = \pi_i^{**} + \frac{\gamma\mu b}{\Lambda} \delta_i + \frac{(b+\gamma)}{\Lambda} c \quad (5)$
<i>...while the socially optimal rate is...</i>	$\pi_i^{**} = \underbrace{\frac{\gamma\mu b}{\Lambda} [\tilde{g}_i - \bar{\rho}_i]}_{\text{Size of financing requirement}} + \underbrace{\frac{\gamma\mu}{\Lambda} c}_{\text{Output cost of taxation}} - \underbrace{\frac{a(b+\gamma)\eta}{\Lambda} \varepsilon_i}_{\text{Output stabilization}}$
	$\text{with } \Lambda = a(b+\gamma) + \gamma\mu^2 b > 0. \quad (6)$
<i>...so that the inflation bias is...</i>	$\pi_i^* - \pi_i^{**} = \underbrace{\frac{(b+\gamma)}{\Lambda} c}_{\text{"Augmented" Barro-Gordon inflation bias}} + \underbrace{\frac{\gamma\mu b}{\Lambda} \delta_i}_{\text{Public sector inefficiency}}, \quad (7)$
Monetary Union M (utilitarian CCB)	$\pi_i^{M*} = \frac{\gamma\mu b}{\Lambda} (FN_A^M) + \frac{(1-\theta_A^M)(b+\gamma) + \gamma\mu}{\Lambda} c - \frac{a(b+\gamma)\eta}{\Lambda} \varepsilon_A^M,$
	for all $i \in M$, with $x_A^M = \sum_{i \in M} \omega_i^M x_i$, for $x \in \{FN, \theta, \varepsilon\}$ (8)
	(cross-country, output-weighted averages within M), and $FN_i = \tilde{g}_i + \delta_i - \bar{\rho}_i$. Hence,
	$\pi_A^{M*} = \underbrace{\pi_A^*}_{\text{Average inflation under national policies}} - \underbrace{\frac{\theta_A^M (b+\gamma)}{\Lambda} c}_{\text{Average reduction in the Barro-Gordon bias}}.$
Legally independent national central banks.	$\pi_i^* = \pi_i^{**} + \frac{\lambda_i (b+\gamma)}{\Lambda} c + \frac{\gamma\mu (b - (1-\lambda_i)\gamma)}{\Lambda} \delta_i \quad (9)$
	with $0 \leq \lambda_i \leq 1$, the extent of political interference. If $\lambda_i = 0$, the government has no influence on central bank's decisions; and if $\lambda_i = 1$, the government effectively sets monetary policy (see (5)).