Africa's Monetary Integration Plans

An Empirical Assessment

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Ich widme diese Arbeit

meiner Frau und meiner Tochter.

Contents

List of Abbreviations

AACB	Association of African Central Banks
ACB	African Central Bank
ADB	African Development Bank
ADF	African Development Fund
AEC	African Economic Community
AIB	African Investment Bank
AMF	African Monetary Fund
AMU	African Monetary Union
AU	African Union
AUC	African Union Commission
BCEAEC	Banque Centrale des États de l'Afrique équatoriale et du Cameroun
BCEAO	Banque Centrale des États de l'Afrique de l'Ouest
CAEMU	Central African Economic and Monetary Union
CAMU	Central African Monetary Union
CEN-SAD	Community of Sahel-Saharan States
CFA	Communauté Financière Africaine
CMA	Common Monetary Area
COMESA	Common Market for Eastern and Southern Africa
EAC	East African Community

List of Abbreviations

ECCAS	Economic Community of Central African States
ECOWAS	Economic Community of West African States
EMU	European Monetary Union
GDP	Gross Domestic Product
HP	Hodrick-Presscott
IDEP	African Institute for Economic Development and Planning
IGAD	Intergovernmental Authority for Development
IMF	International Monetary Fund
MIP	Minimum Integration Program
OAU	Organization of African Unity
OECD	Organisation for Economic Co-operation and Development
REC	Regional Economic Community
RMA	Rand Monetary Area
SACU	Southern African Customs Union
SADC	Southern African Development Community
SIC	Schwarz-Bayesian Information Criterion
SVAR	Structural Vector Autoregression
UMA	Union du Maghreb Arabe
UNECA	United Nations Economic Commission for Africa
VIF	Variance Inflation Factor
WAEMU	West African Economic and Monetary Union
WAMU	West African Monetary Union
WAMZ	West African Monetary Zone

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1. Introduction

Africa, the cradle of humankind, is currently the home of about 15 percent of the global population. Still struggling with the legacy of colonization, poor public institutions, and low education, it only accounts for a mere four percent of global economic output. Nonetheless, there is hope for this very diverse continent with more than 2.000 languages reaching from the Arab-oriented North, over the Sahara to the Savannah with its numerous peoples and cultures and ending at the Cape of Good Hope. In the last two decades, Africa became more and more visible on the radar of international investors as foreign direct investments grew by a factor of ten between 1995 and 2015. The reason for the intensified interest in Africa is that economic growth accelerated considerably during that period of time. Some African nations are currently among the world's fastest growing economies (KPMG and Handelsblatt Research Institute (eds.), 2014). One likely reason for the progress made in that period of time is the intensified and coordinated effort of economic integration which commenced with the foundation of the African Economic Community (AEC) in 1994. The aspiration of the African Union (AU), Africa's counterpart to the European Union, is to emulate the success of Europe's economic and political integration to unlock the continent's vastly underused resources. The ultimate goal is to create a common market for goods, services, and production factors that covers the entire African continent as well as its neighboring islands. That envisaged common market also includes a common currency, achieved by ultimately merging, yet to create, several regional currency blocks into a single African monetary union by the end of the next decade.

This study concentrates on the monetary part of the ongoing and planned economic integration process in Africa. While the benefits of tearing down national boarders that impede trade and the free movement of production factors are rather straightforward, the benefits of (almost) irreversibly fixating exchange rates by abolishing national currencies in favor of supra-national ones do not necessarily outweigh the costs. To be of any benefit, trade between members needs to be high to profit from the reduction of transaction costs, stemming from the need to convert

national currencies and the risk of unexpected exchange-rate movements. And for the costs to be small, economic theory demands that the participating economies need to move sufficiently synchronously, or that they have strong mechanism to absorb macroeconomic shocks, such as flexible wages and prices as well as mobile labor forces. The purpose of this study is to empirically assess whether and to which degree Africa and its regions match the theoretical requirements for a successful monetary union outlined here.

This book is organized as follows. The next chapter gives a detailed overview of the economic integration plans in Africa, its origins in colonial and early post-colonial time as well as the current state of economic integration. The following chapter describes the theory of costs and benefits of monetary unions outlined above. The subsequent chapter is the core of this study. It first describes the methodology and data, and then provides the results of the empirical analyses assessing the costs and benefits of African monetary integration. The next chapter compares the central findings with, and elucidates the contribution of this study to the existing literature. The last chapter concludes and derives policy implications.

2. The History of African Economic and Monetary Integration

This chapter gives an overview over the course and institutions of economic and monetary integration – with emphasis on the monetary part – of the African continent. The relevant institutions and their roles are briefly introduced.

2.1. Colonial time

Colonial Africa was partitioned into colonies and ruled by the European colonial powers with Great Britain and France claiming the major share of the African continent. Part of the colonial governance was the introduction and maintenance of monetary regimes, including three monetary unions[1] between different colonies (Figure 2.1).

Currency boards[2] with parity to the pound sterling were introduced in British West Africa[3] in 1912 and in British East Africa[4] in 1919. The then newly introduced West and East African Shilling replaced a plethora of circulating currencies – the pound sterling in British West Africa and the Indian Rupee in British East Africa, which were complemented by foreign and local currencies and gold – as legal tender. Other British territories in Africa had either their own colonial

[1] A monetary union is defined as a geographical area (not necessarily coherent) in which the same currency is the primary medium of exchange and there are no restrictions to the movement of capital within that area. Hence, nation states with a single national currency are monetary unions between that nation's regions. However, monetary unions are usually defined to consist of at least two (partially) sovereign countries which usually share a common central bank and common pool of reserves (Harris et al., 2007, 12).

[2] A currency board is a variant of a fixed exchange rate regime where the domestic currency is fully backed by reserves of the anchor currency and where the monetary authority guarantees full redeemability of the domestic currency into the anchor currency at the official (fixed) exchange rate. The advantage of a currency board in comparison to a simple fixed exchange rate regime or peg is an increased credibility of the exchange rate fixation owing to the absence of discretionary latitude for the central bank of the country with the currency board as the money supply is determined by the amount of reserves of the anchor currency (Mishkin, 2004, 492-493).

[3] British West Africa encompassed the territories of the current nations of Ghana (former Gold Cost), Sierra Leone, Gambia, and Nigeria.

[4] British East Africa encompassed the territories of the current nations of Kenya, Tanzania (former Tanganyika) excluding the Zanzibar islands and Uganda.

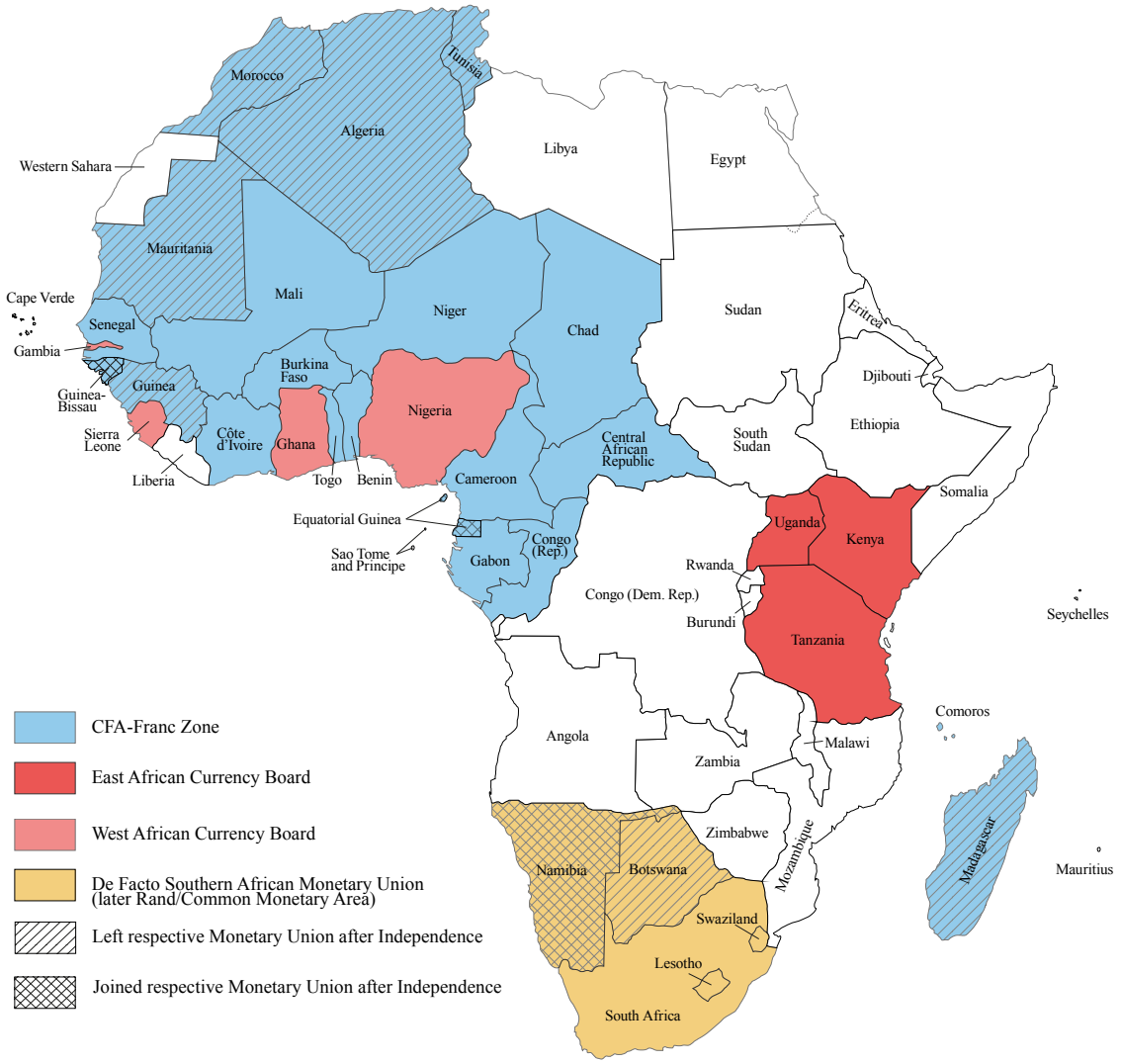

Figure 2.1.: Colonial monetary unions.

Note: Map with current borders and country names. Island countries (Cape Verde, Comoros, Mauritius, Sao Tome and Principe, and Seychelles) only displayed by their major islands.
Source: Own figure, map template by d-maps.com (ed.).

currencies (e.g., Rhodesian pound, Southern Rhodesian pound, South African pound, Egyptian pound, etc.), which were pegged to the pound sterling, or used either the pound sterling itself or the Indian Rupee (British Somaliland and British East Africa before the introduction of the currency board) (Clauson, 1944, 2-25).

The monetary regimes of the French colonies were similar to the ones of the British colonies. The French franc was imposed on all African territories of the French colonial empire. In the

second half of the 19th century, various colonial paper currencies (tokens) were introduced, issued by private chartered banks (e.g., Banque de l'Algérie and Banque de l'Afrique) under the strict supervision of the French treasury, complementing but not replacing the French franc as legal tender. The colonial currencies were pegged to the French franc at a fixed exchange rate. In 1945 the Communauté Financière Africaine (CFA)[5] franc zone was created, as the African arm of the worldwide franc zone. The franc zone was defined by common foreign-exchange controls, the pooling of foreign-exchange reserves, the free convertibility of the colonial currencies, and the French franc as the anchor currency on a fixed-exchange-rate basis (Banque de France (ed.), 2010, 1-3).

In southern Africa a de facto monetary union existed. In 1921 the Union of South Africa[6] established its central bank, the South African Reserve Bank. The South African pound became legal tender and effectively the sole medium of exchange, not only in South Africa but also in the British colonies of Botswana (former Bechuanaland), Lesotho, and Swaziland (former Basutoland) as well as in Namibia (former German South-West Africa and subsequently South-West Africa under South African rule). South Africa established no capital controls within that area while all external transactions were effectively subject to South African currency controls (Harris et al., 2007, 5-8).

The remaining colonial powers, i.e., Belgium, Germany, Italy, Portugal, and Spain, had similar monetary regimes in place as Great Britain and France. They either used the motherland's national currency or issued specific currencies for the circulation within the colony which were often pegged to the motherland's currency.

The colonial currencies and currency boards permitted the colonial powers an enhanced control of the money supply within their overseas territories. Furthermore, it allowed the supply of sufficiently small and large currency denominations to ensure the efficient conduct of domestic and overseas trade. The fixed exchange rates further facilitated trade with the homeland owing to the absence of the risk of unexpected changes of the exchange rate (Clauson, 1944, 4-5). However, colonial currencies were primarily tools to administer and tax the dependent territories in order

[5] Until independence CFA was the abbreviation for Colonies financière africaine (McCarthy, 2006, 36).

[6] The Union of South Africa was a unification of former British colonies (Cape Colony, Natal Colony, Transvaal Colony, and Orange River Colony) and the predecessor state of the current Republic of South Africa. The Union of South Africa gained independence as a dominion within the British Empire in 1910.

to pursue the motherlands' colonial agendas. These agendas – ranging from blatant exploitation over assimilation to association – varied between the colonial powers and changed over time (McCarthy, 2006, 25-38).

2.2. Independence and early post-colonial time

The primary phase of decolonization of the African continent began in the 1950s and lasted until the mid-1970s. During that phase, the majority of African states gained independence[7]. However, the arbitrarily drawn borders of the former colonies, which disregarded ethnic and cultural affiliations, rendered a liability to the then newborn states. Ethnic and religious conflicts led to a number of secessions with South Sudan – gaining statehood in 2011 – as the latest example.

When the British possessions in Africa were released into political independence, they also gained monetary independence. Between 1963 and 1974, the former colonies left the East and West African currency boards. They were successively dissolved and their circulating notes and coins withdrawn. New national central banks assumed the responsibility for the conduct of monetary policy and the issuance of the new national currencies that replaced the shillings as legal tender (de Loynes, 1974, 35-38; Bank of Tanzania (ed.), n.d., n.p.). However, despite gaining formal independence the majority of former British colonies maintained economic links to Great Britain and to the other former colonies by joining the Commonwealth of Nations[8]. Currently 19 African nations – Botswana, Cameroon, The Gambia, Ghana, Kenya, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Nigeria, Rwanda, Seychelles, Sierra Leone, South Africa, Swaziland, Uganda, Tanzania, and Zambia – are members of the Commonwealth (Commonwealth Secretariat (ed.), 2009, 37-39).

In contrast, the majority of former French possessions did not only keep their economic bonds but they also preserved their monetary ties to metropolitan France (Figure 2.1). While the CFA franc zone included all French colonies in Africa initially, after releasing their member colonies into independence, the newly created African nations of Morocco, Algeria, Tunisia, Madagascar, and Guinea (former Guinea-Conakry) left the franc zone to execute their sovereign right of issuing their own currencies and pursuing independent monetary policies. The remainder of the

[7] For a comprehensive list of dates of independence see African Union (ed.) (n.d.b, 1-2)

[8] The Commonwealth of Nations is an association of 53 countries worldwide, most of them former British colonies. The member states cooperate in legal, technical, economic, and political issues on the basis of unanimity (Commonwealth Secretariat (ed.), 2009, 4-36)

former French colonies continued their CFA membership. The African Nation of Comoros kept its currency, the Comorian franc, and maintained the fixed exchange rate to the French franc until 1994 when it was depreciated by 33 percent to approximately 77.19 Comorian francs per French franc. Côte d'Ivoire, Benin (former Dahomey), Burkina Faso (former Upper Volta), Mali, Mauritania (left CFA franc zone in 1973), Niger, Senegal, and Togo form the West African Monetary Union (WAMU)[9] while Cameroon, the Central African Republic, Chad, the Republic of Congo, and Gabon form the Central African Monetary Union (CAMU)[10]. Both monetary unions have their own common currencies, the West African CFA franc and the Central African CFA franc. They were pegged to the French franc until 1999 and since then to the Euro at identical fixed exchange rates[11]. The monetary policies of the unions are conducted by their respective multinational central banks; the Banque Centrale des États de l'Afrique de l'Ouest (BCEAO) for the WAMU and the Banque Centrale des États de l'Afrique équatoriale et du Cameroun (BCEAEC) for the CAMU (Banque de France (ed.), 2010, 2-5).

The de-facto monetary union in southern Africa existed until 1974. In 1969, when the Union of South Africa became the Republic of South Africa, the South African Rand replaced the South African pound as the common currency. The monetary union therefore was called the Rand Monetary Area (RMA). In 1974, the RMA was made official by treaty after all participating states except Namibia (at that time under South African rule) gained independence. However, Botswana left the RMA in 1975. In 1986, the treaty was changed by the Common Monetary Area (CMA) Agreement. It allowed all participating members to issue own currencies; however they are required to be fully backed by reserves of the South African Rand. Namibia, after having gained independence in 1990, joined the CMA in 1992. To the present day, all national currencies maintain a fixed exchange rate at par to the South African Rand which also remains the de facto common currency. The Botswana Pula is, to a large extent, also pegged to the South African Rand as it makes up 60 to 70 percent of Botswana's currency basket (Harris et al., 2007, 7-12).

[9] The former Portuguese colony of Guinea-Bissau joined the WAMU in 1997.

[10] The former Spanish colony of Equatorial-Guinea joined the CAMU in 1985.

[11] In September 1949 the exchange rate of the CFA francs was fixed at 50 CFA francs per French franc. In January 1994 the CFA francs were depreciated to 100 CFA francs per French franc. With France's accession to the European Monetary Union (EMU) the exchange rate to the Euro was automatically set to 655.957 CFA francs per Euro since the conversion rate of the French franc to the Euro was determined to equal 6.55957 French francs per Euro.

2.3. The economic and monetary integration process of the African Union

2.3.1. The beginning: The United Nations Economic Commission for Africa and the Organization of African Unity

With the process of widespread decolonization commencing at the end of the 1950s, the degree of economic and monetary integration of the African continent declined heavily, since the former integration had been an imposed one. At this stage, when merely eight African nations – Egypt, Ethiopia, Ghana, Liberia, Libya, Tunisia, South Africa, and Sudan – were formally independent and after more than a decade of resistance by the colonial powers, the United Nations Economic Commission for Africa (UNECA) was established as the fifth Regional Economic Commission of the United Nations Economic and Social Council. The UNECA's aims are to promote economic and social development of its member states, foster regional integration by providing advice, and assistance to its members [12]. However, during the first years of its existence, UNECA was pre-occupied with assisting the new African countries in building the institutional infrastructure while struggling against the remainders and legacies of colonialism. The speed of formal decolonization in the early 1960s was rapid. Just between 1960 and 1965, the number of independent African nations increased by 26. This rapid change turned out to be counterproductive to the UNECA's objective of economic integration. The artificially drawn boarders between the old colonies were fairly permeable during the colonial time, at least between colonies of the same colonizer. The old colony borders became the state lines of the newborn African nations. These turned out to be much less permeable than the colonial borders due to the national interests of the new nations. (Jolly, 2009, 1-2).

However, African leaders recognized the need for economic and political cooperation and integration. As the process of decolonization was still ongoing, this led to establishment of the Organization of African Unity (OAU) in May 1963 by 23 African countries. The objectives of the OAU, as declared in Article II of the OAU Charter, were:

- To promote the unity and solidarity of the African States;
- To coordinate and intensify their cooperation and efforts to achieve a better life for the peoples of Africa;

[12] Currently, nearly all African nations are members of the UNECA.

- To defend their sovereignty, their territorial integrity, and independence;
- To eradicate all forms of colonialism from Africa;
- To promote international cooperation, having due regard to the Charter of the United Nations and the Universal Declaration of Human Rights.

These goals were to be achieved by the cooperation and harmonization of member states' policies, particularly in the fields of:

- Political and diplomatic cooperation;
- Economic cooperation, including transport and communications;
- Educational and cultural cooperation;
- Health, sanitation, and nutritional cooperation;
- Scientific and technical cooperation;
- Cooperation for defense and security.

(African Union (ed.), 1963, 3).

Simultaneously to the formation of the OAU, UNECA carried on promoting African integration by working towards the set-up of multinational institutions. These efforts led to the establishment of the African Institute for Economic Development and Planning (IDEP) and the African Development Bank (ADB) (Jolly, 2009, 1-2). The Agreement Establishing the ADB was signed in August 1963 by 23 African nations. The purpose and means of the ADB, as defined in Article 1 and 2 of the Agreement Establishing The African Development Bank, is to contribute to the sustainable economic development and social progress of its African member states by financing public or private investment projects (African Development Bank (ed.), 2011b, 2). Initially, the ADB relied solely on resources provided by its African member states since non-African countries were prohibited from admission. As a first step of strengthening the financial base of the ADB, the African Development Fund (ADF) was established in 1972 by the ADB and 13 non-African members. In December 1982, ADB membership was opened to non-regional members to account for the growing need for capital to satisfy the increasing demand for loans. As of December 2011, the ADB

had 53 regional[13] and 24 non-regional members[14]. The combined subscribed capital of the ADB and the ADF amounted to about 85 billion US-Dollars at the end of 2011 (African Development Bank (ed.), 2011a, 3-8).

To foster monetary and financial integration as an essential part of Africa's economic integration, the formation of the Association of African Central Banks (AACB) was agreed upon by the OAU member states in 1965. The goals of the AACB, as listed in article two of its statutes, are to:

- Promote cooperation in the monetary, banking, and financial spheres in the African region;
- Assist in the formulation of guidelines along which agreements among African countries in the monetary, banking, and financial fields shall be reached;
- Help strengthening all efforts aimed at bringing about and maintaining price stability and financial stability in the African region;
- Examine the effectiveness of international economic and financial institutions in which African countries have an interest and suggest ways of possible improvement;
- Envisage, following a well-timed and sequenced convergence process, the advent of a single currency and a common central bank in Africa.

The AACB, headed by the Assembly of Governors, follows the concept of regionalization as well. The five regions (central, eastern, southern, northern, and western) are headed by their respective sub-regional committee which consists of their central bank's governors. Both bodies hold at least one ordinary meeting a year with equal voting rights of each member (Association of African Central Banks (ed.), 2003, 1-14).

2.3.2. The first draft: The Lagos Plan and the Final Act of Lagos

Dissatisfied with the progress of economic and social development, following formal independence, the leaders of the OAU member states agreed upon the Lagos Plan and the Final Act of

[13] Algeria, Angola, Benin, Botswana, Burkina-Faso, Burundi, Cameroon, Cape-Verde, Central African Republic, Chad, Comoros, Congo, Democratic Republic of Congo, Côte d'Ivoire, Djibouti, Egypt, Eritrea, Equatorial Guinea, Ethiopia, Gabon, The Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Libya, Madagascar, Malawi, Mali, Mauritania, Mauritius, Morocco, Mozambique, Namibia, Niger, Nigeria, Rwanda, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, Sudan, Swaziland, Tanzania, Togo, Tunisia, Uganda, Zambia, and Zimbabwe

[14] Argentina, Austria, Belgium, Brazil, Canada, China, Denmark, Finland, France, Germany, India, Italy, Japan, Korea, Kuwait, Netherlands, Norway, Portugal, Saudi Arabia, Spain, Sweden, Switzerland, the United Kingdom, and the United States of America

Lagos in April 1980; the first comprehensive action plan for the economic and financial integration of the African continent. The Lagos Plan and the Final Act of Lagos concluded a series of preceding negotiations and declarations on African integration since the establishment of the OAU. The declared goals were to achieve self-reliance as well as self-sustaining development and economic growth through strengthening member states' economies as well as via a process of economic and political co-operation and integration. Quantitatively the Lagos Plan aimed at reaching a share of two percent of the world's industrial production by OAU member states by the year 2000. To meet the targets, the Lagos Plan included numerous recommendations for national and multinational policies in the fields of agriculture, industry, science and technology, natural and human resource development, environment, energy, transport, communications, trade, and finance. In the field of trade, the Lagos Plan envisaged the increase of intra-African trade through the eventual implementation of an African common market leading to an African Economic Community AEC. The African common market was envisaged to be built in a process of (sub-)regional integration consisting of the successive reductions of tariff and non-tariff trade barriers, the introduction of preferential trade areas under the principle of best favored nation treatment complemented by common standardization, and the establishment of an African Federation of Chambers of Commerce. Trade integration was intended to be supported by financial and monetary integration. In this respect, the Lagos Plan foresees an enhanced cooperation among member states' central banks, the establishment of common regional clearing and payment systems linked together to an African Payments Union until 1990, the creation of an African Monetary and African Mutual Guarantee and Solidarity Fund as well as strengthening the financial means of the ADB (United Nations Economic Commission for Africa (ed.), n.d., 4-97).

Besides the proposals for national and intra-African actions, the heads of state and government agreed to increase cooperation on the international stage. By negotiating collectively, they aimed at increasing their bargaining power in particular towards the developed nations in order to attain the transfer of technology and to negotiate more favorable trade conditions. However, the focus was to achieve national and collective self-reliance and economic independence of African nations while integration into the world economy was regarded as of secondary importance which reflected the disappointment and distrust towards the developed nations which included their former colonial oppressors. Then again, economic and political cooperation with other developing nations was seen as a vital cornerstone of Africa's economic emergence (United Nations Economic Commission for Africa (ed.), n.d., 16-22,68).

The Final Act of Lagos set a timetable for the implementation of the Lagos plan. The AEC was agreed to be set up by the year 2000, implemented in two stages. The first stage, the decade of the 1980s, included the strengthening of existing economic groupings and the establishment of new ones to cover the entire continent, the promotion of coordination and harmonization among the groupings, and the strengthening of sectoral integration at a continental level. The second stage, the decade of the 1990s, incorporated the further deepening of sectoral integration through the harmonization of economic, financial, and monetary policies (United Nations Economic Commission for Africa (ed.), n.d., 98-100).

2.3.3. The concrete schedule: The Abuja Treaty

Despite its ambitious goals, the Lagos Plan and the Final Act of Lagos remained a collection of memoranda of understanding and recommendations which lacked concreteness and means of enforcing its implementation while the need for further political coordination remained high. However, in June 1991, OAU leaders established the AEC by adopting the Treaty Establishing the African Economic Community (Abuja Treaty). The cornerstones of the treaty are the removal of all tariff and non-tariff internal trade barriers, policy coordination and harmonization, a common market with free movement of persons (including free residency), goods, services, and capital as well as the establishment an African Monetary Union (AMU). The AEC is envisaged to be build through a process of regional integration of member states into five Regional Economic Communities (RECs): North Africa, West Africa, Central Africa, East Africa and Southern Africa. The REC are planned to be ultimately merged (African Union (ed.), 1991, 7-10).

Article 6 of the treaty foresees to finalize the transition towards the AEC within 34 years, partitioned into six stages. The first stage (within five years) consists of setting up RECs where they do not already exist and strengthening existing ones. The second stage (within eight years) foresees the stabilization of trade barriers and determining the timetable for their gradual removal. The third stage (within ten years) comprises the establishment of free trade areas[15] and customs union[16] on individual REC level. The fourth stage (within two years) aims at the harmonization

[15] A free trade agreement regulates that goods and services are tradable without tariffs among the participating countries. However, tariffs towards third countries are not harmonized (Krugman and Obstfeld, 2009, 239-240).

[16] A customs union agreement complements a free trade area with a common external tariff which considerably reduces administrative costs for companies and the official sector since documenting and checking the origin of goods crossing internal borders becomes obsolete. However, agreeing to a customs union means relinquishing sovereignty

of tariff and custom systems among the REC in order to establish a continental customs union with a common external tariff. The fifth stage (within five years) is the partial establishment of a common market[17] on a continental scale by harmonizing, inter alia, monetary, financial and fiscal policies, and the application of free movement and residence of natural and legal persons (African Union (ed.), 1991, 10-11).

The sixth and final stage (within five years) is scheduled to finish the development of the African common market by adding free movement of capital. At the sixth stage, the common market is planned to be complemented by a Pan-African monetary union (AMU) with a single African central bank and currency. The AMU is supposed to be achieved by a process of regional integration and harmonization in which regional monetary zones (where not existent) are built and subsequently merged. Moreover, the political integration will be strengthened by establishing a Pan-African Parliament, an African Court of Justice (African Union (ed.), 1991, 11-12, 31-32).

However, the treaty does not provide concrete proposals for the geographical extent of RECs. Most of the current RECs or their predecessors were already in place when the Abuja Treaty was signed, some even trace back their origin to the mid-1960s. With the Abuja treaty OAU leaders set a more concrete timetable for the economic, political, and monetary integration of its member states. But the original goal of the Lagos Plan, to fully establish the AEC until the year 2000, was delayed. The new timetable foresees a maximum of 34 to 40 years to finalize all six stages while the transition from one stage to another is determined by the Assembly of OAU Heads of State and Government. Since the treaty went into force in 1994, after the required number of member states ratified the treaty, the full implementation of the AEC shall be concluded between 2028 and 2034 (African Union (ed.), 1991, 12).

2.3.4. A Call for acceleration: The Sirte Declaration and the establishment of the African Union

In September 1999, the heads of state and government of the OAU met in Sirte (Libya) and decided to convert the OAU into the African Union (AU) and accelerate the integration process laid out by the Abuja Treaty. The implementation stages should be shortened and the implementation

over external tariffs which makes it politically more difficult (Krugman and Obstfeld, 2009, 239-240).

[17] A common market not only includes free movement of goods and a common external tariff it also encompasses free mobility of production factors as well as legal harmonization. A common market can also have a common currency, coordinated macroeconomic policies, a common foreign and defense policy, and even its own military (McCarthy, 2006, 164).

of the Pan-African Parliament, the AMU, and the African Court of Justice should be established ahead of the timetable of the Abuja treaty. In particular, the Pan-African Parliament was envisaged to be realized by the year 2000 (African Governance Institute (ed.), 1999, 2-3).

In July 2000, OAU leaders adopted the Constitutive Act of the AU. The economic integration plans of the AU remained that of its predecessor, i.e., building the AEC through a gradual process of regional integration. Like the Sirte Declaration, the Constitutive Act called for the accelerated implementation of the Abuja Treaty. However, both failed to provide a revised timetable and the means to achieve acceleration (United Nations Economic Commission for Africa (ed.), 2000, 1-19).

2.3.5. The current state of integration

The preceding sections described the evolution of African economic integration plans from the colonial time to the advent of the AU, stating the aspired ends and means. The following section covers the progress actually made so far regarding regional and continental integration and comparing it with the goals set by the various treaties.

2.3.5.1. Regional integration

The AU's integration process envisages to achieve continental economic integration via prior regional economic integration in REC. The Abuja Treaty foresaw to create five RECs as regional country groupings according to geographical location (North Africa, West Africa, Central Africa, East Africa, and Southern Africa). The reasons for integrating Africa's economies on a regional level first instead of outright continental integration are the following. First, the difficulties (political, economic, administrative, legal, etc.) of integrating more than 50 countries at one time into a single entity are far greater than integrating a smaller number of countries. Second, there were a number of regional groupings in place which already shared certain degrees of economic, political, and cultural integration and cooperation (United Nations Economic Commission for Africa (ed.), 2006, 45-46). However, instead of five there are currently eight RECs (Figure 2.2) recognized by the AU as pillars of the AEC, namely the Community of Sahel-Saharan States (CEN-SAD)[18]

[18] Benin, Burkina Faso, Cape Verde, Central African Republic, Comoros, Côte d'Ivoire, Chad, Djibouti, Egypt, Eritrea, Gambia, Ghana, Guinea-Bissau, Guinea, Kenya, Liberia, Libya, Mali, Mauritania, Morocco, Niger, Nigeria, Sao Tome and Principe, Senegal, Sierra Leone, Somalia, Sudan, Togo, and Tunisia

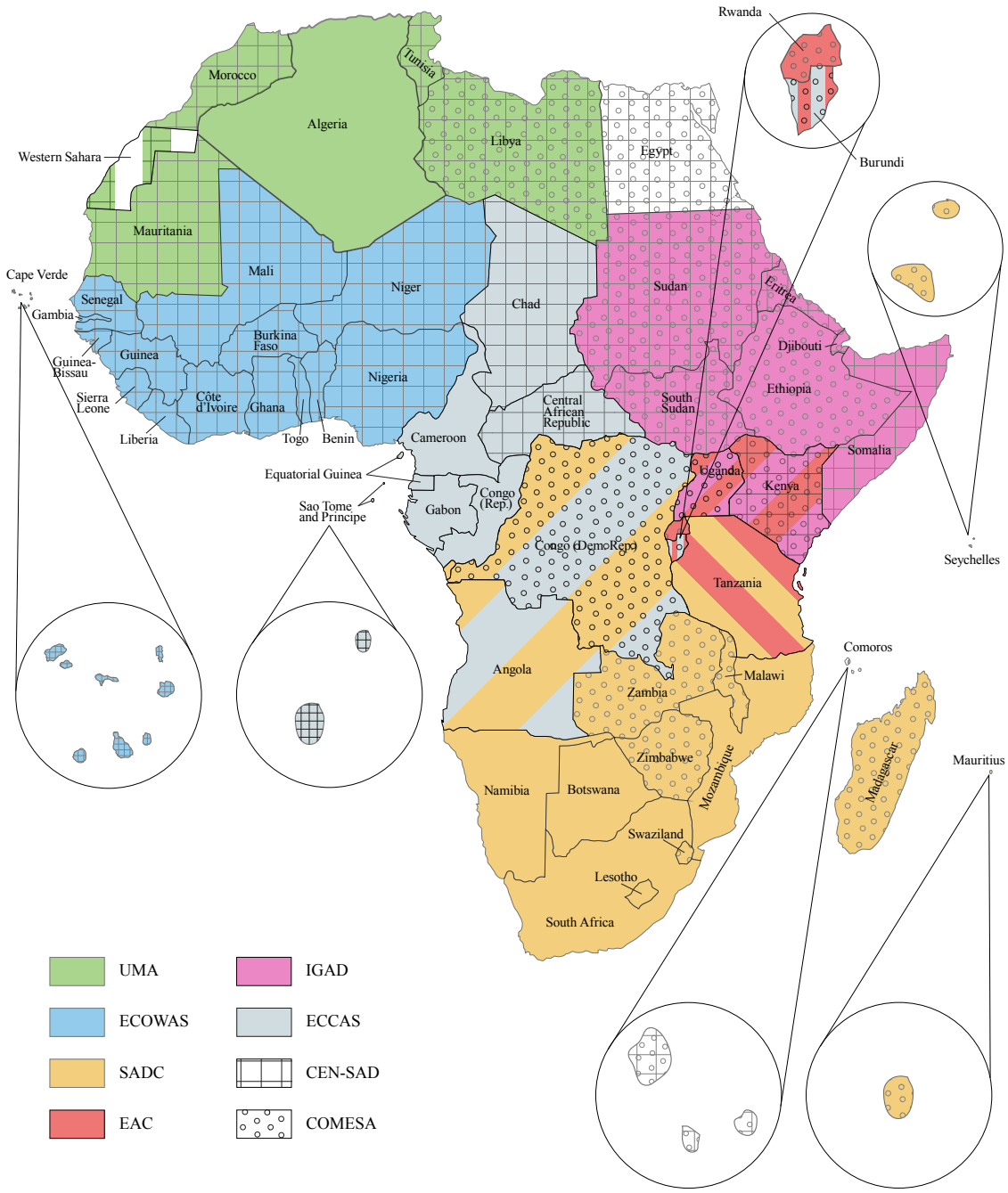

Figure 2.2.: Regional Economic Communities.

Note: Western Sahara is not a sovereign state and most of its territory is occupied by Morocco and de facto belongs to CEN-SAD and UMA. Island countries (Cape Verde, Comoros, Mauritius, Sao Tome and Principe, and Seychelles) only displayed by their major islands.
Source: Own figure, map template by d-maps.com (ed.).

founded in 1998, the Common Market for Eastern and Southern Africa (COMESA)[19] estab-

[19] Burundi, Comoros, Democratic Republic of Congo, Djibouti, Egypt, Eritrea, Ethiopia, Kenya, Libya, Madagascar, Malawi, Mauritius, Rwanda, Seychelles, Sudan, South Sudan, Swaziland, Uganda, Western Sahara (not an official member but de facto as most of its territory is occupied by Morocco), Zambia, and Zimbabwe

lished in 1965, the East African Community (EAC)[20] established in 1999, the Economic Community of Central African States (ECCAS)[21] established in 1983, the Economic Community of West African States (ECOWAS)[22] founded in 1975, the Intergovernmental Authority for Development (IGAD)[23] set up in 1996, the Southern African Development Community (SADC)[24] created in 1980 and the Union du Maghreb Arabe (UMA)[25] founded in 1964 (United Nations Economic Commission for Africa (ed.), 2012a, xi). One of the major problems of the regional integration strategy are multiple REC memberships, as Figure 2.2 illustrates. More than half of all AU countries currently hold at least dual REC membership. Some even participate in three or four RECs. Besides being an obstacle to efficient regional integration and causing considerable political, legal, and administrative issues, multiple memberships also raise the question of which REC and regional monetary union might be the most suitable for the pertained countries; a question which will be addressed empirically in chapter 4. Adding to the confusion of overlapping RECs are economic agreements on sub-REC level, such as the Southern African Customs Union (SACU)[26] of which all members, except Botswana, are also members of the Common Monetary Area CMA[27]. Similarly, the CFA franc monetary unions WAMU and CAMU are subsets of ECOWAS and ECCAS, receptively, while all UMA countries are also members of the Greater Arab Free Trade Area, which also includes the non-African nations of the Arabian Peninsula. In 1994, both WAMU and CAMU expanded their respective sub-regional economic integration by complementing their pre-existing free trade areas and monetary unions with common external tariff. Henceforth, they are referred to as West African Economic and Monetary Union (WAEMU) and Central African Economic and Monetary Union (CAEMU), respectively. Attempts to rationalize regional economic integration – elimination of multiple memberships and the absorption and mergers of existing (sub-)RECs to align them with the Abuja Treaty or at least harmonizing their efforts and programs – did not succeed (United Nations Economic Commission for Africa (ed.), 2006, 47-52).

[20] Burundi, Kenya, Rwanda, Tanzania, and Uganda

[21] Angola, Burundi, Cameroon, Central African Republic, Chad, Democratic Republic of Congo, Equatorial Guinea, Gabon, Republic of Congo, and Sao Tome and Principe

[22] Benin, Burkina Faso, Cape Verde, Côte d'Ivoire, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone, and Togo

[23] Djibouti, Eritrea, Ethiopia, Kenya, Somalia, Sudan, South Sudan, and Uganda

[24] Angola, Botswana, Democratic Republic of Congo, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia, and Zimbabwe

[25] Algeria, Libya, Mauritania, Morocco (not a member state of the AU), Tunisia, and Western Sahara (not an official member but de facto as most of its territory is occupied by Morocco)

[26] The SACU has its roots in colonial southern Africa, with the first customs union agreement between the British colony of Cape of Good Hope and Orange Free State Boer Republic in 1889. Currently the SACU encompasses Botswana, Lesotho, Namibia, South Africa, and Swaziland (Southern African Customs Union (ed.), n.d., n.p.).

[27] The CMA was established 1986 as the successor of the RMA which emerged from the de facto monetary union in southern Africa, with Lesotho, South Africa, and Swaziland as founding members. Namibia joined the CMA in 1994. (Harris et al., 2007, 5-8)

	1. Stage	2. Stage	3. Stage		4. Stage		
Goals	Until 1999: Establish/ Strengthen RECs	Until 2007: Determine time tables for trade barrier removal on REC level	Until 2017: Gradually establish customs unions on REC level		Until 2023: Establish regional monetary unions.		
Sub-Goals			Free-trade area	Customs union	Free movement for persons	Free movement for capital	Monetary union
RECs							
CEN-SAD	est. 1998	✓	2014	X	✓	X	X
COMESA	est. 1965	✓	✓	✓	2014	2025	2018
EAC	est. 1999	✓	✓	✓	✓	✓	2023
ECCAS	est. 1983	✓	✓	✓	X	X	X
ECOWAS	est. 1975	✓	✓	2015	✓	X	2020
IGAD	est. 1996	✓	X	X	X	X	X
SADC	est. 1980	✓	✓	2012	2015	2015	2018
UMA	est. 1964	✓	X	X	X	X	X
selected Sub-RECs							
CAEMU	est. 1994	✓	✓	✓	2015	✓	✓
CMA	est. 1986	✓	✓	✓	X	✓	✓
SACU	est. 1886	✓	✓	✓	X	only CMA	only CMA
WAEMU	est. 1994	✓	✓	✓	✓	✓	✓

✓ - implemented
✓ - ongoing implementation
"year" - envisaged year of completion
X - not yet started

Table 2.1.: Progress of regional integration

Note: Monetary union, free movement for persons and capital on REC level were not officially part of the stages of Article 6 of the AEC treaty. However, they are defined for the continental level in Articles 43 (free movement of people), 44 (monetary union) and 45 (free movement of capital) of the AEC treaty. Article 44 also states that the African Monetary Union is to be created by harmonizing regional monetary unions which is part of the sixth stage of the AEC treaty which commences 2023, which implicitly sets the latest date for implementing regional monetary unions also to 2023. Free movement of persons includes visa exemption, freedom of residence, employment, and establishment for natural and legal persons of member states. Envisaged years of completion which are in the past were missed and so far no new timetable has been agreed.
Source: African Union Commission (ed.), 2009, 14-120; United Nations Economic Commission for Africa (ed.), 2012a, 14-19; African Union Commission (ed.), 2013, 22-84

Table 2.1 summarizes the progress and current state of regional economic integration in comparison to the goals set by the Abuja treaty. So far, all RECs, except IGAD, formally completed stages one and two. Stage three, the establishment of regional customs unions is still ongoing and has to be completed by 2017. However, progress diverges severely between the RECs. While the EAC already completed stage three, IGAD and UMA not even initiated its implementation. The remaining RECs are in various stages of setting up their free trade areas and customs unions with previously set timetables regularly missed. Moreover, even if free trade and common customs agreements are formally reached, they often suffer from slow implementation and limited compliance in member states.

On the subject of monetary integration, none of the eight RECs has introduced a common currency yet. The EAC originally planned its monetary union, with the East African Shilling as

its currency, to be launched in 2012 which was then shifted to 2023. So far, besides the EAC only the SADC and the COMESA agreed on a concrete schedule for monetary union in 2018 and ECOWAS by 2020. ECOWAS, of which only the five Anglophone member states (Gambia, Ghana, Liberia, Nigeria, and Sierra Leone) and Guinea are not part of the WAEMU, plans to establish its regional monetary union in two stages. The first stage is to launch a second monetary union, the West African Monetary Zone (WAMZ), alongside WAEMU, which in the second stage is to be merged with the WAEMU by 2020. Hence, the monetary unions inherited from the colonial time on sub-REC level, the CFA franc zones and CMA, remain the only monetary unions on the African continent which also exhibit higher degrees of economic integration, meeting already all regional integration criteria of Article six of the Abuja treaty. The WAEMU, as a subset of ECOWAS, also grants free movement for persons. However, some RECs already initiated preliminary steps for monetary unification such as the establishment of common payment and settlement systems, common clearing houses, and coordinated national monetary and exchange rate policies. At the same time, they are working towards full convertibility of national currencies, the definition and surveillance of macroeconomic and fiscal convergence criteria, and development harmonized statistical, financial and accounting frameworks. Some RECs also established predecessor institutions of future central banks which coordinate the monetary integration process and national monetary policies.

The reasons for slow progress in some RECs are manifold. The issue of multiple REC and sub-REC memberships is one of the more obvious ones. Others are the lack of sufficient financial and human resources, insufficient funding of the REC institutions, the lack of sufficiently developed political and administrative infrastructures (corrupt and poorly trained officials, red tape, insufficient staffing, nepotism), the lack of political will and vision (e.g., UMA objects its official status as REC), vested interests, ideological differences, and the lack of compensatory mechanisms to address inequalities in the sharing of the costs and benefits of integration (e.g., tariffs and customs are a significant source of public revenues). Moreover, internal conflicts – like most recently in Mali, the secession of South Sudan and its aftermath – are also as much an obstacle to progress as political conflicts between member states. For instance, UMA is paralyzed for decades owing to the political differences between Morocco and Algeria regarding the status of Western Sahara. Morocco even left the OAU/AU because it recognized Western Sahara as a member state and has not renewed its membership since (African Union Commission (ed.), 2009, 14-120; United Nations Economic Commission for Africa (ed.), 2012a, 14-19; African Union Commission (ed.),

2013, 22-84).

2.3.5.2. Inter-regional and continental integration

Regional economic integration is still in progress, however, the ultimate goal is to achieve continental integration. According to the Abuja treaty, the first stage of continental integration – the merger of all regional free trade areas into a continental one within a period of two years – is envisaged to commence in 2018. Besides the fact that currently only half of the eight RECs have fully established their regional free trade areas and two not even started their implementation, the lack of inter-REC coordination might become a major obstacle to continental integration as well. Harmonization of RECs' integration programs, concerning all relevant areas, would not only avoid unnecessary effort but would also foster a much faster continental integration. In particular in the area of monetary integration, homogeneous convergence criteria of all RECs would make the continental monetary integration (sixth stage of the Abuja treaty ranging from 2023-2028) much easier since all member states would have a common macroeconomic convergence framework under which they already work during the regional integration phase. However, African leaders have taken some significant measures to address the issue of inter-REC coordination. The first is the tripartite arrangement of COMESA, EAC, and SADC of 2008. The tripartite agreement established a mechanism for inter-REC cooperation which focuses on the harmonization of REC programs in the areas of trade and infrastructure development via regular summits of the participating RECs' leaders, common committees, task forces, and pooling of financial resources in common, ring-fenced trust accounts. The most significant achievement of the ongoing cooperation of the three RECs is the agreement to establish a common free trade area. Covering more than 50 percent of the AU's population and Gross Domestic Product (GDP), the tripartite agreement gives a significant boost to African continental trade integration. It also sparked the adoption (January 2012) of an AU action plan to accelerate the continental trade integration. The action plan envisages achieving the continental free trade area two years ahead of the Abuja treaty timetable, i.e., in 2017. Another significant initiative is the Minimum Integration Program (MIP) which was launched in 2009. It provides a consensual framework for cooperation and coordination of the stakeholders of African integration, i.e., the member states, the RECs, and the AU. It aims at increasing inter-REC convergence in selected priority areas in a variable geometry approach[28]. The MIP's implementation is partitioned into three stages, each spanning over four years (Table 2.2). The priority areas, goals,

[28] The term variable geometry denotes an approach that allows for different integration speeds of member states, RECs, and sub-RECs. Therefore, slow progress of some member states or regional groupings does not decelerate that of others (United Nations Economic Commission for Africa (ed.), 2012a, 21).

		1. Stage		2. Stage		3. Stage	
Priority area	Sub-area	2009-2012		2013-2016		2017-2020	
Trade	Trade barriers	Gradual reduction of tariff and non-tariff barriers in all RECs	✓	Elimination of all tariff barriers and non-tariff in all RECs	✓	Elimination of all tariff and non-tariff barriers at the continental level	X
	Rules of origin	Simplification and harmonization of the rules of origin	✓	Rules of origin harmonized at the regional level	✓	Rules of origin harmonized at the continental level	X
	Free trade	Signing of partnership agreements between RECs	✓	Creation of inter-REC free trade areas: (COMESA, SADC, EAC, IGAD) and (ECOWAS, ECCAS, CENSAD, UMA)	X	Continental free area until 2017 according to the AU action plan to accelerate the continental trade integration	X
	Customs	Harmonization of procedures and establishment of customs union in all RECs	✓	Customs union in both inter-REC free trade areas	X	Continental customs union with common external tariff	X
Free movement	persons	Complete within all RECs	✓	Partially between RECs	X	Complete on continental level	X
	goods	Complete within all RECs	✓	Partially between RECs	X	Complete on continental level	X
	capital and services	Partially within RECs	✓	Partially between RECs	X	Complete on continental level	X
Fiscal policy and macroeconomic convergence		Convergence of inflation, interest rates and public finances within RECs	✓	Convergence of inflation, interest rates and public finances between RECs	X	Convergence of inflation, interest rates and public finances between RECs	X
Monetary policy		Deepening of actions towards the creation of the African Central Bank and the African Monetary Fund	✓	Establishment of a monetary union in all RECs	X	Establishment of a continental monetary union with common currency and central bank	X
Financial market development		Creation of the Pan African Stock exchange	X	Foster development of national and regional financial markets	X	Establishment of an African transferable stock market	X
		✓ - implemented		✓ - ongoing implementation		X - not yet started	

Table 2.2.: Minimum Integration Program: Goals, timetable, and progress

Note: Table includes only priority areas which are of most relevance for monetary integration. The entire MIP also encompasses the priority areas: peace and security, infrastructure and energy, agriculture, industry, investment, science and technology, social and political affairs, and capacity building. A continental free trade area until 2017 is not part of the MIP but of the 2012 AU action plan to accelerate the continental trade integration.
Source: African Union Commission (ed.), 2010, 24-27; African Union Commission (ed.), n.d., 3-46

instruments, performance indicators, and timetables are defined in the "First action plan for the implementation of the Minimum Integration Programme" whose progress is monitored by the AU. The MIP ambitiously revises the timetable of the Abuja treaty, antedating particularly continental integration. Most notably, the AMU is set to be completed by 2020, IGAD is set to join the tripartite free trade area of COMESA, SADC, EAC by 2016 while ECOWAS, ECCAS, CEN-SAD, and UMA are set to create their own inter-REC free trade area until 2016. So far, the timetable of the MIP has not been met owing to the same reasons that hamper regional integration (African Union Commission (ed.), 2010, 1-27; African Union Commission (ed.), n.d., 3-46; African Union Commission (ed.), 2013, 22-84; United Nations Economic Commission for Africa (ed.), 2012a, 21-23).

Since its foundation, the AU continued the institution building its predecessor, the OAU, initiated. The Assembly of Heads of States and Government is the supreme organ of the AU. The

Executive Council, composed of ministers or representatives designated by the governments of member states, is directly subordinated to the Assembly and is responsible for coordination and harmonization of policies of member states, RECs, UNECA, and AU institutions. Together with the 2004 established Pan-African Parliament[29] they form the legislative branch of the AU. The African Union Commission (AUC) – comprising of eight commissariats, each with its own portfolio[30] – represents the executive branch of the AU. The judicial powers of the AU are executed by the African Court on Human and Peoples' Rights which has been established in 2004, absorbing the 2003 created African Court of Justice into a single court.

The institutions of the AMU, the African Central Bank (ACB), the African Monetary Fund (AMF), and the African Investment Bank (AIB) have yet to be established. Currently, the AACB, as the predecessor organization of the ACB, and the AU are drawing up the protocol for the establishment of the ACB. The work on the AMF and the AIB is in a somewhat more advanced stage. The AIB protocol and statute were adopted by the Assembly of the African Union Heads of State and Government in 2009, endowing the AIB with an initial capital stock of 25 billion US-Dollars. Owing to the lack of full ratification of member states, neither the AMF nor the AIB have taken up operations (African Union (ed.), n.d.a, n.p.; African Union Commission (ed.), 2013, 151-153).

2.4. Summary

This chapter commenced with describing the situation during Africa's colonial era. Economic and monetary integration was fairly high during that period of time. With decolonization this imposed integration came to an end. However, African leaders saw the need to re-integrate the continent economically and politically in order to overcome the legacy of colonialism and to bring peace and prosperity to Africa's peoples. The efforts to re-integrate Africa began already during the early phase decolonization and culminated in the ratification of the Treaty Establishing the AEC (Abuja Treaty) in 1994. Figure 2.3 summarizes the course of events and planned integration milestones that are described in detail in this chapter. The Abuja treaty foresees to economically and monetarily integrate the whole continent in a process of regional integration and ultimately

[29] The Pan-African Parliament is located in Johannesburg, South Africa. It is supposed to evolve into a parliament with full legislative powers in the course of African integration. Currently it has merely advisory and consultative functions.

[30] The eight portfolios of the AU commission are: Peace and Security, Political Affairs, Trade and Industry, Infrastructure and Energy, Social Affairs, Rural Economy and Agriculture, Human Resources, Science and Technology, and Economic Affairs.

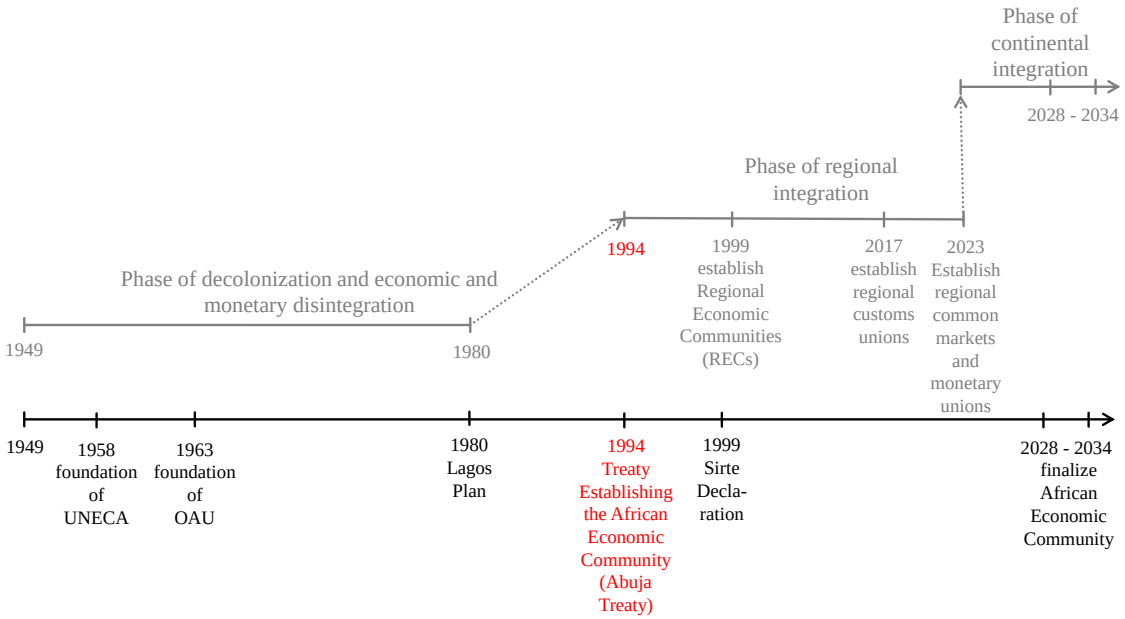

Figure 2.3.: Time line of Africa's historical and planned economic integration.

Source: Own figure.

continental integration. Regional monetary unions are envisaged to be implemented by 2023 and continental monetary union between 2028 to 2034. However, so far the ambitious integration plans were not met by an equally ambitious implementation. Even though some regions perform better than others, timetables were regularly missed and shifted to the future. This book empirically assesses Africa's integration plans from the perspective of the theory of optimum currency areas, which is introduced in the next chapter.

3. Theory: The Costs and Benefits of Monetary Unions

The previous chapter presented the history and current state of African economic and monetary integration. This chapter lists the theory of costs and benefits of monetary unions to understand the rationale of African leaders and to lay the theoretical foundation for the empirical analyses of chapter 4.

3.1. Benefits

One of the primary reasons for economic integration in general is fostering trade among the participating nations in order to enhance their economic welfare. This is achieved by removing existing trade barriers and thereby reducing transaction costs and administrative obstacles which otherwise would have raised the costs of the exchange of goods or even prevented it entirely. These static efficiency gains are supplemented by dynamic ones originating from increased competition, economies of scale, larger incentives for innovation, and greater product variety. In particular less developed and rather closed economies have great unused potentials which can be unlocked by economic integration (Krugman and Obstfeld, 2009, 212-214).

An additional reduction of transaction costs and therefore a boost to trade can be achieved by complementing the removal of tariff and non-tariff trade barriers with monetary integration. Having a common currency and a common payments system in transnational trade makes the exchange of currencies obsolete. From a macroeconomic point of view, production factors which in the absence of a monetary union are solely occupied with conducting currency exchanges and coordinating national payments systems can be relocated towards other productive uses.

Moreover, monetary integration entails potential indirect benefits. Consumers might be able to make better price comparisons and price predictions when goods are priced in the same currency.

That should lead to more efficiency of the price mechanism, better integrated markets, and, hence, more competition, lower prices, smaller price differentials, and ultimately increased allocation efficiency. Another potential benefit originates from the fact that a currency union eliminates the risk of unforeseen changes of the exchange rate(s) with the currencies of trading partners. This potentially fosters transnational trade as well as may lead to increased welfare when risk aversion is assumed. Indeed, exchange rate variation can result in higher profits and lower prices on the level of individual customers and companies if the exchange moves in a – from their point of view - favorable direction. However, this unexpected windfall is met by an equal loss in the books of the trading partner or in other sectors of the same economy. Moreover, currency appreciations might in the short run increase the turnover of exporters but also impair their international price competitiveness (De Grauwe, 2012, 54-62).

The absence of exchange rate uncertainty can also lead to a reduction of risk premiums on interest rates which reduces problems associated with imperfect and asymmetrically distributed information like moral hazard and adverse selection. Both phenomena lead to, on average, riskier investments and, hence, increase the systemic risk of the financial sector (De Grauwe, 2005, 74-76). From a neoclassical growth theory point of view, lower real interest rates lead to temporary higher growth rates of macroeconomic output as well as a higher output level in the steady state. Introducing dynamic economies of scale where the rate of technological change depends on the stock of capital (endogenous growth) and possibly free dissemination of technological knowledge may even yield permanently higher growth rate of macroeconomic output. However, these effects can only take hold if a monetary union does not lead to greater uncertainty, for instance about macroeconomic output, unemployment, price stability, the sustainability of government debt, and stability of the financial sector as discussed in the next section (De Grauwe, 2012, 62-67).

The reduction of transaction costs and the elimination of exchange rate uncertainty may also not only foster the movement of goods but also that of production factors. Investors are more likely to be willing to invest in other union member states since their returns are more predictable and relieves them of the costs of exchanging currencies. It also facilitates the creation of bigger and, thus, more liquid capital markets. The same applies to the labor force since it makes wages and salaries more comparable, predictable, and stable relative to the home country's costs of living. Hence, currency union enables additional deepening of a common market which increases its efficiency.

Forming a monetary union with a supranational and politically independent central bank might also lead to more stable prices. This might enable countries which suffered from unstable and highly volatile prices to avoid the costs associated with that. However, if a country with previously highly stable prices joins a monetary union, it might end up with a less stable price level and, hence, has to bear costs (Krugman and Obstfeld, 2009, 575-576).

Additional benefits of a monetary union can emerge when the common currency is - more often than the former national currencies - used as a medium of exchange in international transactions outside the union, i.e., becomes an international reserve currency. One advantage of this is that the union's central bank can create more currency as necessary for domestic purposes without creating inflationary pressure since the surplus is used outside the union. This creates additional central bank profits, i.e., seigniorage as well as interest payments on reserve accounts and securities which go to public budgets and reduce the need for levying other taxes. Moreover, having an international reserve currency makes it easier and less costly for the governments as well as the private sector to issue bonds since it creates a more liquid bond market. Foreigners - in particular central banks - buy these bonds to invest their currency reserves. However, this also entails a moral hazard risk of excessively using this source of finance and accumulating unsustainable external debt. If the new common currency gains the status of an international reserve currency, that might also be beneficial to the domestic financial sector since foreigners may be more willing to invest our issue debt denoted in that currency while the incentive for domestic residents to invest abroad dwindles. This might bring additional business to the union's financial sector and may lead to dynamic effects such as the accumulation of financial know-how which, in turn, attracts new business. In addition, if the common currency becomes internationally accepted, a larger share of international trade can be conducted in the common currency. This reduces the exchange rate uncertainty while a larger share of borrowing from international creditors might also be conducted in the common currency instead of foreign currencies (De Grauwe, 2012, 67-71).

Apart from primarily economic considerations one has to bear in mind that a currency might be seen by people as a symbol of (supra-national) unity. If a common currency is able to create a spirit of unity among the participating nations, it can induce further integration in other areas such as political, legal, institutional, cultural, and financial ones. That, in turn, might unlock further economic efficiency and welfare gains through deeper market integration and increased

competition (Burda and Wyplosz, 2013, 522-525).

3.2. Costs

Unfortunately, monetary unions do not only generate benefits for their member states but also involve costs. They arise primarily because anti-cyclical national monetary policies are no longer possible and member countries lose their bilateral nominal exchange rates as a correction mechanism for internal imbalances resulting from diverging national developments (De Grauwe, 2012, 3).

3.2.1. Asymmetric shocks and monetary union

Mundell's (1961) seminal paper laid the basis for the costs involved in creating a monetary union. A situation in which monetary union membership incurs considerable costs is when demand shifts from one member state's products to those of another member state, leading to equal shifts in the current accounts of the countries and possibly to current-account imbalances. Demand shifts might occur if the paces of technological advancement differ, if national business cycles are not fully synchronized, or if member states are hit by asymmetric shocks[1]. In the absence of monetary union, i.e., in case of flexible exchange rates between national currencies, the exchange rate mechanism or active exchange rate policies by national central banks tend to re-balance the current account via nominal adjustments. Within a monetary union, nominal exchange rate adjustments are naturally impossible. To equilibrate the current account, wages and prices need to adjust. In case of short-term nominal rigidities, which would lead to temporary under-utilization of macroeconomic production capacities, i.e., unemployment and idle capital, in the countries which currencies would have depreciated and over-utilization of macroeconomic production capacities and inflationary pressure in the countries which currencies would have appreciated. Such a situation is economically and politically undesirable since the use of macroeconomic production capacities is inefficient and considerable social costs are incurred. Another way to relieve such situations and rebalance the external accounts is the movement of production factors from the economies in recession to those in economic boom. Labor (Mundell, 1961, 657-664) and physical capital

[1] Shocks are unanticipated events that have direct or indirect effects on the endogenous variables of (an) economic system(s), e.g., output, prices, and capacity utilization. Asymmetric shocks are defined as disturbances that affect various economic systems (national economies) differently. These shocks can be country-specific, i.e., their effects are limited to the concerned country's economy, or common shocks which effects are not limited to one country's economy but affect countries differently. In contrast, symmetric shocks are common shocks that have similar effects on different economic systems (European Commission (ed.), 1990, 141).

(Ingram, 1973, 23-24) could move from one member country with under-utilization of its capacities to countries with full or over-utilization and thereby relieving idle factors (unemployment) and deflation/disinflation on the one hand and capacity shortages and inflation on the other hand. However, since these movements bear considerable (social) costs and take time, they offer no solutions to temporary shocks, only to permanent ones. Mobility and existing cross-member state diversification of financial capital (Atkeson and Bayoumi, 1993, 303-304) is a veritable way to adjust to temporary disturbances as well by distributing income (gains on financial capital) between member states. The reason is that, financial capital can be moved with low costs and in short time, in particular in the current digital age. To summarize, the costs of monetary union are higher the less synchronized national business cycles are, the less flexible nominal wages and prices are, and the less mobile production factors are (Mundell, 1961, 657-664).

Naturally, the question arises whether asymmetric shocks and dis-synchronized business cycles are likely phenomena. Moreover, it is necessary to explore whether monetary union membership itself is a relevant factor in determining the occurrence and likelihood of asymmetric shocks (endogenous monetary unions). The sources of asymmetric shocks are manifold. They are rooted in the differences in size, structure, and behavior of an economy and the differences in preferences of its economic agents. Country-specific shocks are an obvious source of asymmetries. They have their origin in changes in domestic natural, human, and capital resources, for instance as a result of catastrophes. Or they occur because economic agents change their behaviors or their preferences alter. These kinds of country-specific shocks remain rather unaffected by monetary integration although it might be argued that if monetary union deepens the integration of product and factor markets, behavioral and preferential changes are less likely to be contained within national borders. Diverging national monetary and fiscal policies may also be sources of asymmetric shocks although they play somewhat ambiguous roles. They can generate asymmetric shocks but they also react endogenously in order to cushion shocks as part of counter-cyclical policy responses. The creation of a monetary union would eliminate national monetary policy as a source of asymmetric shocks but would limit the country's capacity to react to a shock since the entire burden would fall on fiscal policy. However, the leeway of national fiscal policies might also be limited in a monetary union as discussed in section 3.2.3. This leads to the possibility that asymmetric shocks become more pronounced and persistent in monetary unions since nominal exchange rate adjustments as swift counter-reactions are also ruled out. Moreover, policy measures of the common monetary policy may also be a source of asymmetries if transition channels and the velocity of adjustments differ between member states. Also, other common shocks like sharp increases in prices of inter-

nationally traded commodities such as crude oil or changes of the common currencies exchange rate may be causes of asymmetric shocks. Member countries differ in their economic structures, behavior, preferences, and initial situations which result in different adjustment mechanisms and speeds with similar results as country-specific shocks, i.e., internal current account imbalances and possibly more persistent and volatile business cycle fluctuations. Other factors in determining the probability of asymmetric reactions to common shocks are the structure, diversification, and relative sizes of industries - to average out sector-specific shocks - of national economies (Kenen, 1969, 4-60), their degree of market integration or openness (McKinnon, 1963, 717-725), and the structure of intra-union trade. If product markets are predominantly integrated on an inter-industry basis, common shocks to a specific sector, e.g., changes in demand for certain products, increase asymmetric reactions to common shocks if certain industries are only located in one or few member states. If, however, product market integration and trade is primarily intra-industrial, sector-specific shocks should spread more evenly across member states. As it was argued in the previous section, a monetary union is expected to increase the integration of product and factor markets and, hence, can either mitigate or exacerbate asymmetric reactions to common shocks (European Commission (ed.), 1990, 140-147).

3.2.2. Monetary union and monetary policy

The size of the costs of a monetary union depends on the ability of national monetary policies and flexible nominal exchange rates to mitigate shocks and to account for diverging developments. However, both means of adjustment may suffer from considerable shortcomings which greatly impair their effectiveness and efficiency and therefore may greatly reduce the costs monetary union membership entails. But a common monetary policy faces specific limitations as well.

In case of asymmetric shocks, national monetary policies could react with counter-cyclical policies leading to exchange-rate adjustments. In case of permanent shocks, such as a permanent shift in demand from one country's goods to that of another, wages and prices need to adjust if the pertained countries were to return to their initial output or price levels. The reason is that currency depreciations or appreciations change the price of traded goods. Since these goods are part of domestic consumption and production input, changes of the nominal exchange rate also alter consumption and input costs. Over time, this possibly leads to wage and price increases in countries with depreciated currencies and wage and price moderation in countries whose currencies gained

in external value. Hence, the initial adjustment via the nominal exchange rate would be neutralized over time as the real exchange rate returns to its initial level. In a monetary-union setting, wages and prices adjustments over time are the only means to regain the output or price levels prior to an asymmetric shock. Owing to nominal wage and price rigidities, the adjustment process would probably be costlier in a monetary union since nominal exchange rate adjustments and counter-cyclical monetary policies would cushion the impact of adjustment on price levels and capacity utilization. Thus, unemployment, idle capital, and lost output would be lower in countries hit by a permanent negative shock while inflation due to over-utilization of production capacities would be mitigated in countries hit by a permanent positive shock.

Apart from permanent asymmetric shocks, membership in a monetary union also disarms member states of independent monetary policies as an important macroeconomic stabilization tool to counter temporary asymmetric shocks. This also sheds light on the dilemma of a common monetary policy that needs to fit all member states. The central bank sets its policy rate and minimum reserve requirement and decides on open-market operations based on the monetary union's (weighted) average macroeconomic situation (inflation, output gap, etc.) and the exchange rate of the common currency reacts accordingly. A single monetary policy is condemned to inaction or merely partial reaction in case of asymmetric shocks or diverging business cycle positions of member states. It is incapable of mitigating unemployment and lower output in some countries without exacerbating over-utilization and inflation in other member states. The same applies to the common external exchange rate. Its value depends on the union's average interest rate, current-account balance, and price developments relative to those of non-member economies. The exchange rate is therefore at best partially capable to serve as a mechanism to counter asymmetric shocks (De Grauwe, 2012, 30-37). Moreover, since the common interest rate and exchange rate depend on the union's average, they could have potentially high distorting effects on interest rate or exchange rate sensitive sectors such as real estate, banking, investment in real capital as well as import and export industries in member countries. This problem is particularly pronounced in countries that differ considerably from the union's average inflation and output gap. These distortions could lead to unsustainable booms and asset price bubbles in some member countries while others face prolonged economic slumps and national current-account imbalances are likely to become more pronounced and persistent. Hence, common monetary policy might even become a source of asymmetric developments itself. In addition, on the one hand, various cross-country differences, as discussed in the following sections, may also lead to asymmetric effects of common monetary

policies. On the other hand, monetary union eliminates national monetary policies as a potential origin of asymmetries.

In sum, even if wage and price flexibility in member states is considerably high and production factors are mobile, they will need more time to correct for permanent asymmetric shocks compared to independent national monetary policies. If flexibility and mobility is low, wages, prices, and production factor movements might react too slowly to mitigate temporary asymmetric shocks. As a consequence, national business cycle periods might become more accentuated and persistent and the social costs of adjustment are potentially much higher in a monetary union. This also has a political dimension. More accentuated and persistent output and price level fluctuations and inability to cushion asymmetric shocks might threaten the acceptance and (political) legitimacy of the monetary union and its institutions in member countries. Moreover, economically larger member states are naturally favored in monetary decisions since they have a higher weight in the union's average economic situation even if voting rights are equal. This further adds to the issue of lacking political acceptance (De Grauwe, 2012, 173-190).

3.2.3. Monetary union and fiscal policy

When joining a monetary union, member states transfer their monetary sovereignty to a supranational central bank. This loss of monetary independence also has considerable repercussions for national fiscal policies. Even if member states maintain their fiscal sovereignty de jure, monetary-union membership de facto limits the capacities of governments to decide on national public expenditures. The reason is that national public debts are denominated in the common currency, i.e., a currency of which supply the national governments have no control of. That limits their ability to pursue debt-financed expansive fiscal policies, particularly if they already have an accumulated high levels of public debt. Hence, monetary union membership lowers the point at which public debt becomes unsustainable or the point at which it might be considered as such by financial market participants and, therefore, forces governments to limit public deficits and debts. That might have an advantageous restraining effect on public finances in normal times. In the event of asymmetric economic crises, the ability of national governments to pursue anti-cyclical fiscal policies – the only national macroeconomic stabilization tool left in a monetary union – might be gravely limited. Governments might even be forced to pursue pro-cyclical austerity policies, thereby aggravating asymmetric shocks, to maintain financial market trust to avert self-fulfilling prophecies and national bankruptcy. A possible capital flight from member states that are perceived as having

unsustainable public finances to member countries regarded as sound further adds to the asymmetric shock, leaving the (over-)indebted countries capital-stripped with high interest rates while the others enjoy capital influxes and low interest rates.

If a monetary union is not supplemented by an effective mechanism to avoid sovereign defaults, their higher risk of occurrence raises the level of uncertainty within the monetary union. That, at least partly, offsets the advantages gained from the elimination of exchange rate uncertainty, especially if economic agents price in the possibility of a breakup and the return to national currencies. One such mechanism to make monetary union more robust would be to extend economic and political integration to public budgets. Countries would not only surrender monetary independence but also the major share of fiscal sovereignty. Taxation, debt issuance, public budgets, and the dispersion of revenues to national and regional budgets would be centrally decided. Moreover, direct transfers to union residents, e.g., a common unemployment insurance, would act as an insurance against the results of asymmetric shocks while the risks of asymmetric shocks would be pooled on the supra-national level. Furthermore, the centralized budget and debt would ensure that automatic stabilizers and anti-cyclical fiscal policies on national levels are not restrained by fears of losing the trust of financial markets. Furthermore, national fiscal policies as a possible source of asymmetries and asymmetric shocks would cease to exist. Obviously, such a fiscal union would raise the question of political acceptance in the contributing nations and entail a considerable moral-hazard risk in receiving countries. Countries have little incentive to pursue sound fiscal policies. However, the moral hazard problem could be addressed by a centralized budget control with far reaching enforcement powers vis-a-vis national public budgets. Moreover, a fiscal union would also decrease the need of adjustments of wages and prices in the private sector. A fiscal union therefore might be a costly solution to permanent demand shocks if it prolongs necessary adjustments in member states due to moral hazard. But it also gives countries – in particular ones with high wage and price rigidities and low factor mobility – the necessary time for adjustments without creating high adjustment cost (Bayoumi and Eichengreen, 1993, 193; De Grauwe, 2012, 7-18).

3.2.4. Different preferences about inflation and unemployment

Countries or rather their economic agents might differ in their preferences regarding inflation and unemployment. Assuming that a stable relationship between inflation and unemployment (Phillips curves) exist in potential member states of a proposed monetary union, their governments and cen-

tral banks would be able to conduct fiscal and monetary policies as to achieve the inflation and unemployment rate that best fits the preferences. Forming a monetary union of countries with different preferences and different Phillips curves would mean that these countries would have to accept a combination of inflation and unemployment that is not optimal because monetary policy decisions in a monetary union are made on the basis of the union's average preferences. Moreover, if countries were to maintain different inflation and unemployment rates, e.g., using fiscal policy, the countries with higher inflation rates would continuously lose internal and external competitiveness since there are no internal exchange rate adjustments and the external exchange rate depends on the average inflation and interest rate of the union (De Grauwe, 2007, 13-15).

However, the argument holds true only when stability of the Phillips curves is assumed. Owing to the effects of changing inflation expectations of economic agents in response to monetary policy decisions (Kydland and Presscott, 1977, 473-887), Phillips curves are not expected to remain stable in the long run and, hence, leave central banks without the option of choosing between different combinations of inflation and unemployment. Nonetheless, there still are a transitory effects when countries with different initial inflation rates join a monetary union since the Phillips curve is expected to still be of relevance in the short run. Thus, aligning inflation rates to avoid changes in competitiveness, as discussed above, still leads to temporarily sub-optimal combinations of inflation and unemployment in member states. Once that transition phase is concluded, all countries return to their unemployment rates fluctuating around their natural rate with the business cycle (De Grauwe, 2007, 40-42). The countries with initially higher inflation rates may even gain welfare since they end up with lower inflation costs while unemployment remains unchanged. If average union inflation is not reduced to that of the lowest initial inflation rate of all member states – depending on the politically agreed mandate of the union's central bank – then countries with initial inflation below average union inflation lose welfare since they have to permanently accept higher inflation without gaining permanently lower unemployment (European Commission (ed.), 1990, 92-98).

The existence of short-run Phillips curves is also of importance for optimal monetary policy responses to shocks. In a setting of nationally independent monetary policies with currencies linked via flexible exchange rates national central banks might have different optimal responses to shocks depending on the preferences of inflation and unemployment within their jurisdictions. As discussed above, the central bank of a monetary union comprising of countries with different

preferences might only, if at all, be able to respond to asymmetric shocks based on the unions average preferences, i.e., leading to welfare losses in member states (Baldwin and Wyplosz, 2006, 359).

3.2.5. Different labor markets institutions and wage setting mechanisms

Differences in national labor markets, i.e., their institutions and the ways wages are set, are a possible source of diverging developments. In a case of full centralization of wage bargaining, trade unions have little incentive to make excessive wage claims, i.e., above productivity growth, since they would entail inflation and, hence, no real wage increase. If wage bargaining is decentralized with numerous small trade unions, the inflationary effect of their excessive nominal wage claims remains negligible from the individual labor union's point of view. Thus, labor unions have an incentive to make excessive wage claims to achieve real wage increases for their members since the (inflation) costs are socialized and other unions are likely to act equally. Therefore, nominal wage increases are likely to be higher in economies with decentralized wage bargaining. Hence, wage and price increases are likely to differ between monetary union members, leading to current account imbalances. In case of a common shock, different reactions are likely as well. In contrast to fully centralized labor unions, decentralized labor unions have no reason to moderate their wage claims to adjust to the shock owing to the incentive to pursue a free-rider strategy. However, the more wage bargaining is decentralized the more significant is the outcome of wage negotiations for the competitiveness of the affected companies and, hence, the employment prospects of union members. That effect also restrains wage claims, leaving economies with medium sized unions as the least equipped to deal with common shocks. Therefore, such countries have potentially higher costs when they join a monetary union (De Grauwe, 2012, 18-20).

However, the way wages are set might not be independent of monetary union membership. Labor unions' decisions on wage claims depend on the reaction of fiscal and monetary policies on their claim. If excessive wage claims lead to combinations of inflation and unemployment that are considered sub-optimal by the authorities, they are likely to be countered by monetary and fiscal policy actions. To the extent that unions anticipate such counteractions, they change their behavior accordingly. Monetary union centralizes monetary policy and limits the leeway of national fiscal policies. Thus, trade unions in different member states face the same policy responses. That might have a harmonizing effect on wage claims. However, considerable differences are likely to remain

and, hence, the associated costs in terms of diverging wage, price, and employment developments and impaired shock adjustment mechanisms. That may point to the conclusion that it might be optimal to centralize wage bargaining on a monetary union level. However, nominal wage growth should reflect differences in productivity growth to maintain internal and external competitiveness of member economies. Hence, if productivity grows at different speeds in member states, wage bargaining should remain on national levels (De Grauwe, 2012, 27-29).

3.2.6. Different legal and financial systems

Legal requirements and regulations have profound ramifications for the functioning of markets. If the legal systems of member states differ substantially, those differences might be another reason why member countries diverge economically and respond dissimilar to shocks. For instance, differences in financial market regulation may lead to diversity of national financial systems. Some member state's financial systems might be more bank-oriented while other member state's financial systems rely to a high degree on capital markets. Moreover, in some countries loans interest rates are usually fixed for the duration of that loan while in other countries loans usually have floating interest rates. These differences affect how member economies respond to shocks. They also affect the transmission of the common monetary policy. Capital-market oriented national financial markets are likely to be more responsive to the wealth channel[2] while their bank oriented counterparts are probably more sensitive to the bank-lending channel[3]. This effect leads to asymmetric reactions and impairs the effectiveness of counter-cyclical monetary policy even if member states are in the same stage of the business-cycle (De Grauwe, 2012, 20-22).

However, differences in national financial systems are not solely the result of the legal frame-

[2]The wealth channel, also known as the balance-sheet channel, describes the transmission of monetary policy to the real economy via its effects on the net worth of (potential) borrowers. Their costs of external finance in comparison to internal finance decline with increasing net worth because they can provide more collateral and higher equity ratios and, hence, lower the lender's risk. Since investment and spending decisions of companies and households depend, inter alia, on their net financial positions, monetary policy can affect their decisions via its impact on their net financial position. Interest rate changes alter the amount of interest expenses on outstanding floating-rate loans and revolving short-term debt which affects the financial positions of borrowers. Moreover, the reverse relationship of interest rates and the value of assets also affects their prices and, hence, the net worth of their owners (Bernanke and Gertler, 1995, 35-40).

[3]The bank-lending channel describes the transmission of monetary policy to the real economy via its effects on the supply and relative price of credit intermediated by banks. For instance, open market operations, changes of the policy rate, and alterations of minimum reserve requirements affect the refinancing costs of banks and the overall quantity of credit the banking system is able to create. From the perspective of potential borrowers, this alters the availability and the price of bank loans relative to other sources of finance such as bond and equity issuance (Bernanke and Gertler, 1995, 40-43).

work in which they operate. Different courses of national monetary policies might also played a significant role in the past. Inflation paths caused by different monetary policies shaped financial markets. For instance, high and volatile inflation probably crippled the development of long-term bond markets since they are sensitive to unexpected inflation and fostered the development of markets with short maturities. Moreover, in a volatile inflation environment interest rates are likely to be floating rather than fixed to be able to account for sudden changes in inflation. Countries with a history of stable and low inflation are likely to have developed the reverse system, i.e., more developed long-term debt markets and fixed interest rates. Monetary transmission is largely dependent on the term and interest-rate structure of debt markets. Changes of the central bank interest rate affect financing costs much faster if borrowing is primarily short-term and interest rates are adjustable and vice versa. However, under a common monetary policy regime the differences described above are likely to disappear over time and, thus, equalize monetary transmission mechanisms in member states. Hence, common shocks are less likely to lead to asymmetric reactions. Efforts to harmonize legal and regulatory systems also help to reduce asymmetric reactions to common shocks (De Grauwe, 2012, 29-30).

3.2.7. Different fiscal systems

Public budgets can be financed by three major sources: taxes, monetary financing (seignorage), and the issuance of sovereign debt. The optimal composition depends on the costs the respective means of finance incur and is reached when their marginal costs are equal. While monetary financing ultimately creates inflation and, hence, inflation-related costs, taxes lead to distortions of the price mechanism and therefore to inefficiencies. The costs of inflation depend on its degree as well as on whether it is anticipated or not. The distortionary effects of taxes depend on the kind of taxes levied as well as on the efficiency and effectiveness of the tax system and authorities. Hence, if countries with different optimal financing compositions of their public budgets form a monetary union, they will be forced to apply a new mix of finance which might not be optimal since the amount of seignorage revenues is decided supranational. This incurs a loss of welfare if spending is not adjusted. However, changes in the revenue structure incurred by monetary union membership could also incentivize reforms and harmonization of the tax system to lower its costs (De Grauwe, 2005, 20-21).

3.3. Comparison of costs and benefits

Several of the costs and benefits discussed above depend on the degree of product, service, and factor market integration. Benefits, originating from the elimination of transaction costs, exchange rate uncertainty, and market fragmentation, are higher the more the (potential) member countries exchange products, services, and factors (De Grauwe, 2012, 70-71). In contrast, the costs of a monetary union are likely to decline the more integrated monetary union members are although there are some factors that might lead to the opposite result.[4] The more member states trade goods and services, the less likely are shocks limited by national borders. However, the structure of trade (inter- or intra-industrial) and regional distribution of export industries determine the symmetry of responses to common shocks. Also, if factor markets are more integrated, the necessary adjustments to asymmetric shocks, i.e., factor movements, are much faster concluded. This reduces the costs incurred by asymmetric shocks. Another reason concerns the effectiveness of the nominal exchange rate changes in a setting of monetarily independent nations. The effect of terms-of-trade changes on aggregate demand and aggregate supply as well as the aggregate price level are much more pronounced in countries where exports and imports represent larger shares of domestic production and consumption. While the net effect of demand and supply changes on domestic production might not depend on the degree of trade integration, the variability of the aggregate price level increases with the degree of openness of an economy. To the extent that price level volatility incurs costs, the systematic use of monetary policy as a macroeconomic stabilization tool will lead to higher costs in more open economies. Hence, monetary union membership is less costly for more open than for relatively closed economies (McKinnon, 1963, 717-724; De Grauwe, 2012, 50-53).

To summarize, costs and benefits of a monetary union are dependent on a country's trade integration (Figure 3.1). At the intersection point T^*, costs and benefits are equal. All countries to the left of T^* are better off being monetarily independent while countries to the right of T^* would gain from monetary union membership. The exact initial location of the costs curve, however, depends on the degree of factor mobility, price and wage flexibility, and the frequency and severity of asymmetric shocks. The costs curve is located the more to the left, the less frequently asymmetric shock

[4] Economic integration, as a result of economies of scale, might lead to less symmetry of shocks and business cycles if it leads to regional concentration of the production of certain goods. In that case, sector-specific shocks are more likely to assume macroeconomic proportions for the country in which the sector is concentrated. Thus, the costs of a monetary union would increase the more countries trade with each other and with the rest of the world (Krugman, 1993).

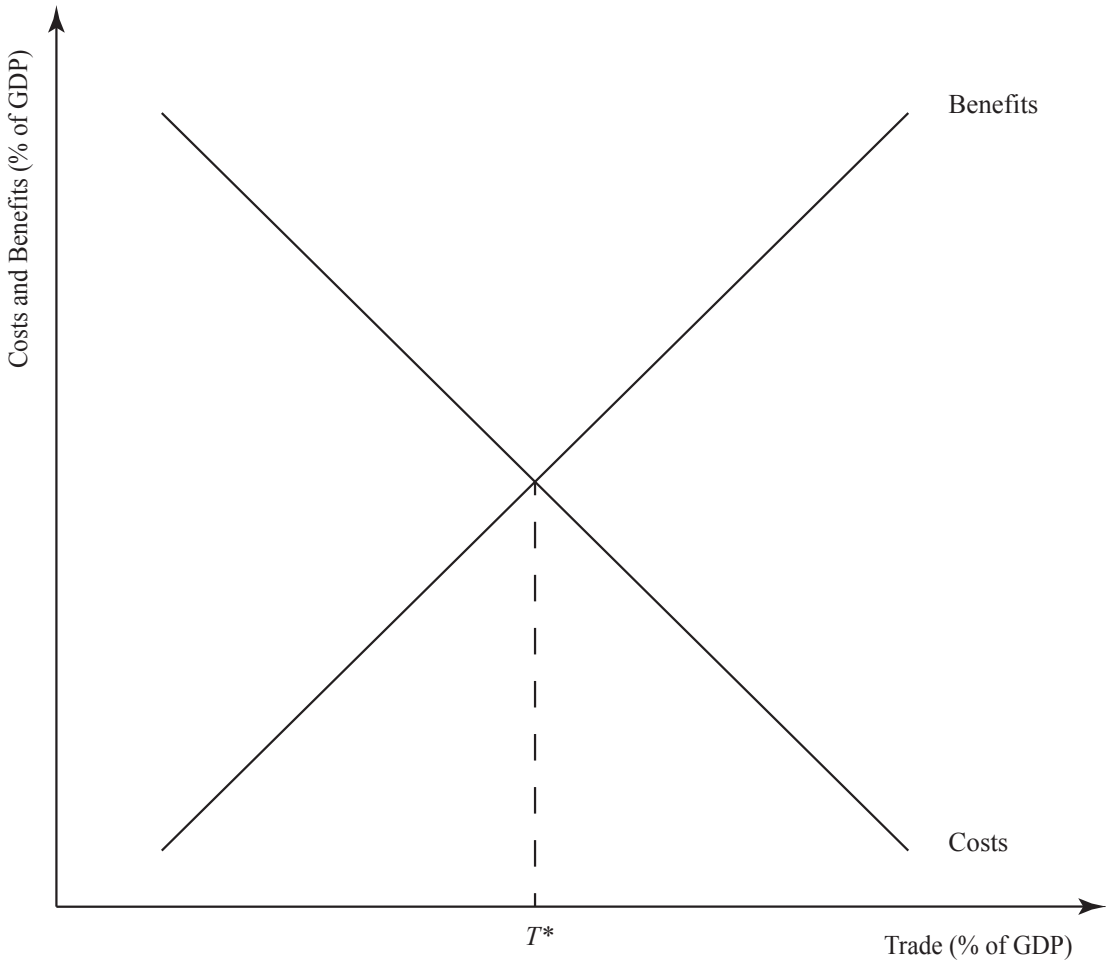

Figure 3.1.: Costs and benefits of monetary union as a function of trade integration.

Source: De Grauwe 2012, 73.

occur, the more mobile production factors are and the less rigid prices and wages are. The initial position of the benefits curve is determined by the initial degree of trade and market integration. However, as it was argued above, monetary union membership itself is expected to deepen trade integration and, thus, rendering monetary union membership worthwhile even for countries (not too far) left of T^* as their benefits curve would likely move to the right. Also, the position of the costs curve is likely to move to the left as membership induced deepening of trade relation, factor market integration as well as political and legal harmonization lowers the likelihood of asymmetric shocks and shock responses. Moreover, the shock adsorbing mechanisms (factor mobility, wage and price flexibility, and fiscal transfers) might be enhanced as well through membership itself, hence, shifting the costs curve further to the left. Apart from the initial and final positions of the costs and benefits curves, their slopes and, therefore, the initial and final locations of T^* remain uncertain depending on the effectiveness of exchange rate changes to correct asymmetric shocks.

The less effective the nominal exchange rate instrument is, the steeper is the slope of the costs curve and the more to the left is T^* located, i.e., the lower is the necessary trade integration at which monetary union membership renders worthwhile (De Grauwe, 2012, 72-86).

4. Empirical Evidence on Costs and Benefits of African Monetary Union

4.1. Empirical research questions

This chapter empirically addresses the following research questions. They arise from the previously discussed theoretical costs and benefits. The empirical analyses are done on the level of the eight RECs introduced in Chapter 2 which together form the AEC.

1. How high are intra-African and intra-REC trade?
2. How diversified is African trade?
3. How synchronized are the business cycles of African countries or how common are asymmetric shocks?
4. Is business cycle synchronicity endogenous?
5. How flexible are prices and wages?
6. Do migration flows mitigate asymmetric shocks?
7. Which regional monetary union is the most suitable one for countries with multiple REC memberships?

4.2. General remarks on data sources and data aggregation

The major sources of data are the World Bank Development Indicators database for data on national accounts (GDP, GDP deflator, deflator of total sales) and the International Monetary Fund (IMF) Direction of Trade Statistics for data on trade flows. Both databases provide level data in annual frequency. Data on migrant stocks is obtained from the United Nations in a ten year frequency. National accounts data are denominated in national currencies or US-Dollars, trade

flow data are measured in US-Dollars. Price indices are converted to the common base year of 2005. Incomplete time series from the World Bank Development Indicators database are completed by chain linking them with data from national sources, the International Financial Statistics of the International Monetary Fund, or the University of Pennsylvania World Tables. Aggregates of country groups, such as the RECs, are calculated using GDP-weighted sums of countries' growth rates with time-varying weights as proposed by Beyer, Doornik and Hendry (2001). Since national accounts data are quoted in national currency, this method avoids converting level data into a common unit of account, such as the US-Dollar, which could considerably distort it owing to exchange rate movements. However, the weights still need to be calculated using real GDP level data denoted in a common currency (US-Dollar) which still leaves a distortion of the weights. Since for aggregation the weights are multiplied with usually relatively small growth rates, the potential error remains fairly small compared to the error an aggregation of level data in US-Dollar would entail. Country group aggregates always have the full sample rage of 1961-2012. For a few member states, level data does not date back to 1960 and in the case of Somalia national accounts data ends in 1990. For Western Sahara and South Sudan are no data available. For aggregation, the weights of countries with missing data are set to zero for the missing observations.

Even though the bulk of data used in this study is obtained from renowned international institutions, such as the IMF, the World Bank, the United Nations, and the University of Pennsylvania World Tables, the quality and reliability of the data may not hold up to the standards of industrialized countries' statistics. The reason is that their data, for the most part, still relies on national sources or is estimated based on very small and incomplete data sets. In addition, statistical offices in African countries usually lack the necessary capacities in terms of equipment and manpower to gather extensive micro-data. Furthermore, they are often not independent institutions and are therefore subject to political influence (Sandefur and Glassman, 2014). Moreover, the share of the informal sector[1], of very small companies and self-employment, and of subsistence production is rather high. Unfortunately, their activities are not or only incompletely recorded by official statistics (African Development Bank (ed.), 2013).

[1] Lesser and Moise-Leeman (2009) estimate that the size of Africa's informal sector to be 43 percent of official GDP and the African Development Bank (ed.) (2013) estimates it to be about 55 percent of GDP in sub-Saharan Africa.

4.3. Descriptive statistics

This section shows some descriptive statistics on key macroeconomic variables, i.e., economic growth, inflation and per capita income levels. The aim of this is to demonstrate how diverse the macroeconomic situations of the future member states of the proposed regional monetary unions are.

4.3.1. Economic growth and per capita income

Figure 4.1 shows average annual GDP growth rates of REC member states before and after the Abuja treaty went into force in 1994. Except for Zimbabwe, all African nations experienced a higher macroeconomic output in 2011 than in 1994. Generally, average growth rates seem to have been higher in the post-1994 period (usually 1994-2012) than in the pre-1994 (usually 1961-1994) period. Some countries even enjoyed annual growth rates beyond five percent – rates which are common among emerging market economies. However, the overwhelming majority of African nations are developing countries where high growth rates are, to some extent, the result of low GDP levels (figure 4.2).[2] Moreover, growth rates are often highly volatile. The high volatility is possibly the result of the high dependency of many African nations on a small number of export products, such as raw materials and agricultural products, and of political instability. Also, positive GDP growth should not hide the fact that living standards grew much slower and in some countries even declined as population growth outpaced GDP growth (figure 4.2). Compared to industrial countries, GDP per capita levels are very low in the majority of African countries. Only a few exceed 1000 US-Dollars (real US-Dollars in year 2000 prices) and incomes are often highly unequally distributed. For comparison, Germany's real GDP per capita was 26,183 US-Dollars in 2011.

It should also be noted that the differences in per-capita incomes and growth rates across members of the same RECs are often very high. For instance, in SADC and COMESA both the poorest (Democratic Republic of Congo) and the richest (Seychelles) African countries are members. Moreover, SADC and COMESA also combine member states with an average growth rate of real GDP of about ten percent between 1994 and 2011, such as Angola and Rwanda as well as Zimbabwe, which suffered negative average growth rates in the same period of time.

[2] High growth rates are the result of the low base effect. The same absolute growth leads to higher growth rates in economies with a low GDP than in economies with high GDP levels

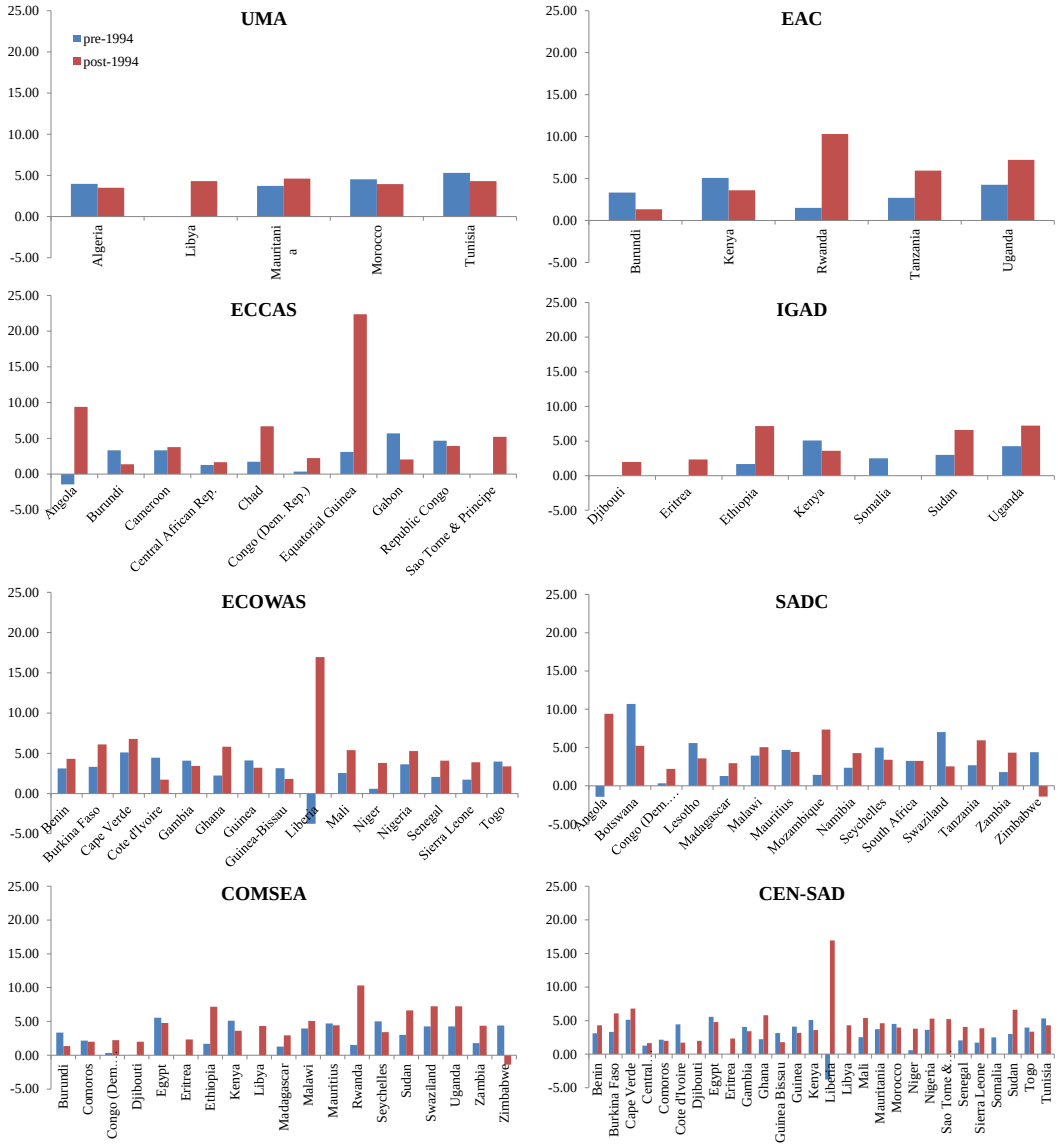

Figure 4.1.: Average GDP growth in REC countries pre- and post-1994.

Note: Arithmetic averages of annual real GDP growth rates. Pre- or post-1994 graph missing for Djibouti, Eritrea, Libya, and Somalia owing to insufficient data. Sudan excluding South Sudan.
Source: World Bank World Development Indicators, own figure and calculations.

4.3.2. Inflation

Inflation rates (annual rates of change of the GDP deflator) in Africa are very diverse as well (Figure 4.3). While some countries managed to maintain fairly stable prices, some countries' inflation rates were very high. Also, the differences between and within RECs are very pronounced. However, many countries were able to rein in inflation in the post-1994 period compared to the pre-1994 period.

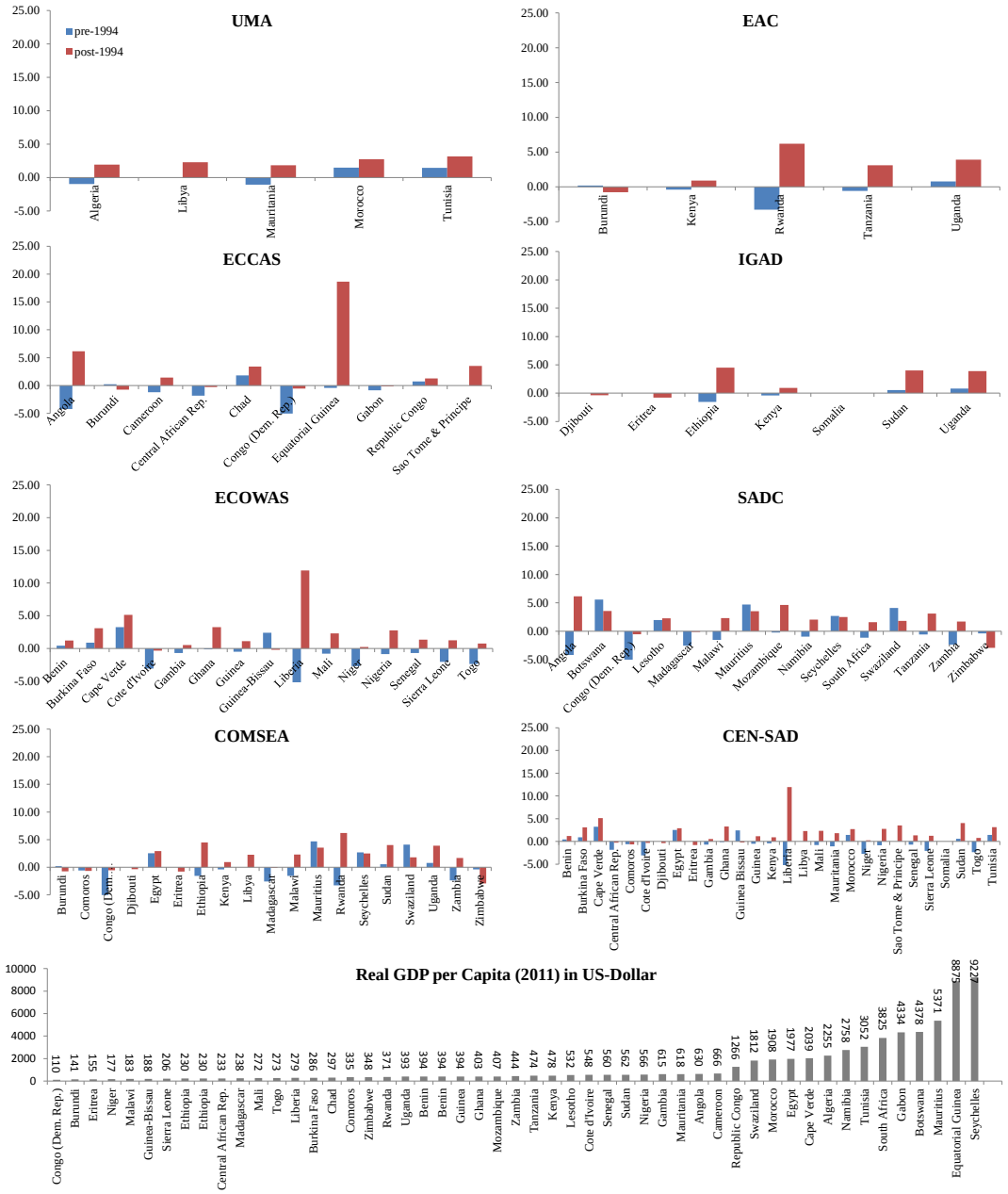

Figure 4.2.: Average GDP per capita growth rates and levels in REC countries pre- and post-1994.

Note: Arithmetic averages of annual real GDP per capita growth rates. GDP per capita in real US-Dollar (base year: 2000). Pre- and/or post-1994 graph missing for Djibouti, Eritrea, Libya, and Somalia owing to insufficient data. Sudan excluding South Sudan.
Source: World Bank World Development Indicators, own figure and calculations.

The different inflation rates reflect to a large part different monetary policy approaches and success in keeping prices stable (if price stability is even a goal). In some countries, central banks

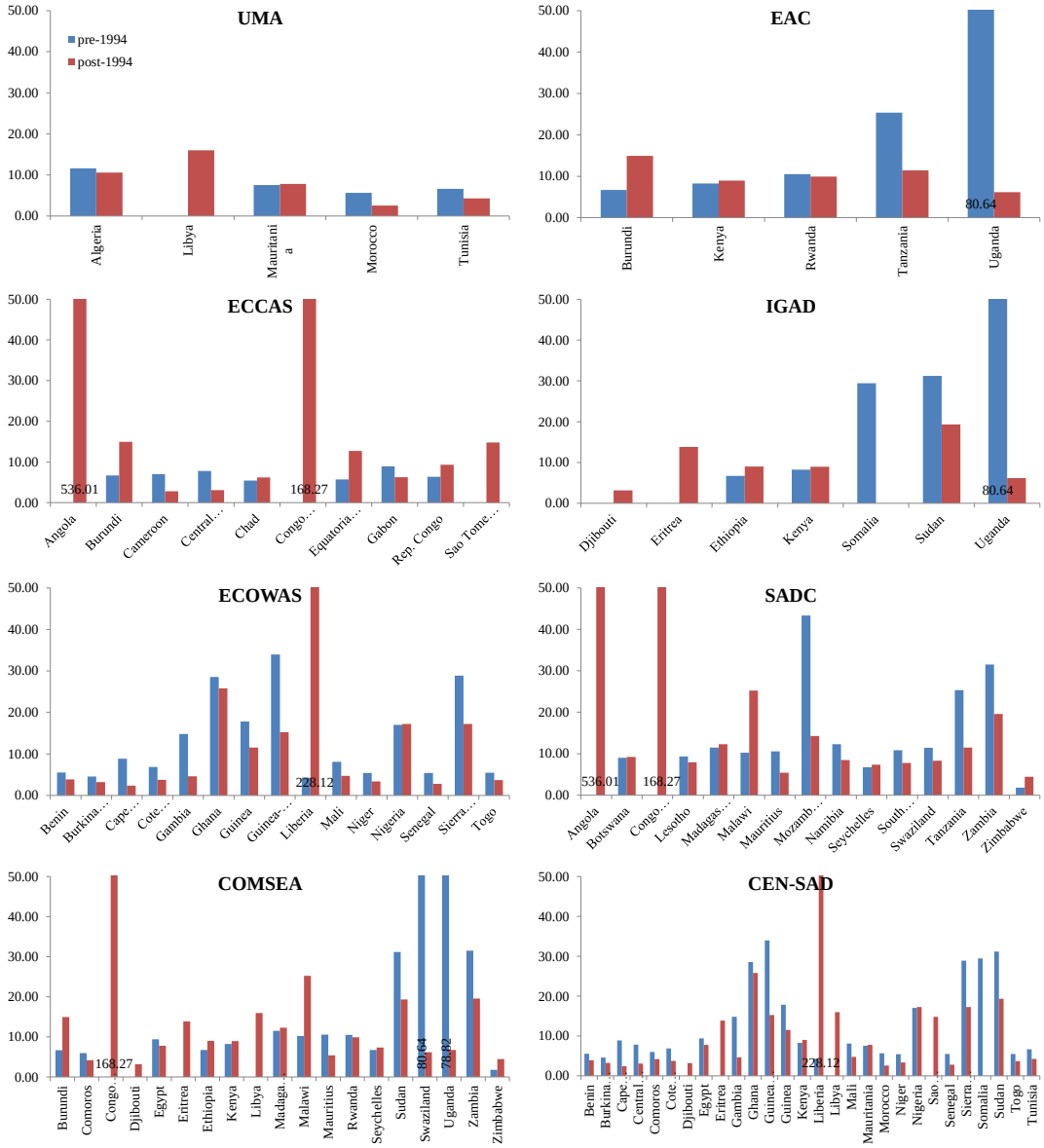

Figure 4.3.: Average inflation rates (GDP deflator) in REC countries pre- and post-1994.

Note: Arithmetic averages of annual GDP deflator rate of change. Pre- and/or post-1994 graph missing for Angola, Congo (Democratic Republic), Djibouti, Eritrea, Libya, Sao Tome and Principe, and Somalia owing to insufficient data. Graphs out of rage for Angola, Congo (Democratic Republic), Liberia, Swaziland, and Uganda. Sudan excluding South Sudan.
Source: World Bank World Development Indicators, own figure and calculations.

are mere departments of the finance ministry and have the primary purpose, besides providing legal tender, to generate revenue through seignorage. In particular, if tax systems are inefficient, seignorage is a major source of public finances beside revenue generated from tariffs and customs. Looking at ECCAS and ECOWAS indicates that an improved monetary policy regime can lead to significantly lower inflation. Member states that belong to the CFA franc currency unions

CAEMU and WAEMU have smaller inflation rates than the member states with national monetary policies such as Angola, the Democratic Republic of Congo, and Liberia. This is not surprising as CAEMU and WAEMU are governed by independent, supranational central banks with strict rules concerning monetary financing in order to maintain their fixed exchange rate to the French franc and since 1999 to the Euro.[3]

4.3.3. Interim conclusion

Looking only at these few key macroeconomic variables indicates that the planned regional and ultimately continental monetary union(s) in Africa combine economically heterogeneous countries. Difference in per capita income and economic growth are very high as are the differences in inflation rates. The theory of optimum currency areas, however, demands the opposite, i.e., homogeneous member states. That points to the conclusion that a monetary union seems currently not advisable. In particular, the very high deviations in inflation necessitate very pronounced nominal exchange rate adjustments to keep price competitiveness between the African nations unchanged. Before introducing a common currency which fixes nominal exchange rates, inflation rates need to converge to a common and stable rate. If these different inflation rates reflect poor national monetary policies, the convergence of inflation rates is a desirable goal[4]. In the following sections the criteria of the optimum currency area theory are tested empirically to examine whether this interim conclusion holds true.

4.4. Trade

This empirical section covers trade. As discussed in chapter 3, (the intensity of) trade plays a significant role in the determination of benefits and costs. Data are obtained from the IMF Directions of Trade Statistics as well as the World Bank World Development Indicators.

4.4.1. Openness

Before employing more sophisticated empirical methods, the simple look at the trade statistics of African countries already renders valuable insights. As Figure 4.4 demonstrates, the degree of internal trade integration of the African continent as a whole is very limited and varies significantly among RECs. In the overwhelming majority of countries, the share of intra-African

[3] The French finance ministry guarantees the fixed exchange rate to the CFA francs. Moreover, the French finance ministry and the French central bank (Banque de France) are involved in the decision making process of the CAEMU's and WAEMU's monetary policy.

[4] If, however, they reflect different inflation preferences, an equalization of inflation rates would mean a loss of welfare.

and intra-REC trade[5] remains low compared to trade volumes with non-African countries. UMA and ECCAS exhibit the lowest degree of intra-REC trade integration while that of ECOWAS and SADC is significantly higher. However, even in the SADC, which include the long-term customs union members Botswana, Lesotho, Namibia, South Africa, and Lesotho, internal trade is lower than 17 percent of GDP. Hence, the initial gains of monetary union in terms of lower transaction costs, lower exchange rate uncertainty, and market de-fragmentation would be fairly small. The comparatively high share of international trade might render national currency pegs to a basket of the currencies of major trade partners more fruitful. Moreover, one major reason of the low intra-REC and intra-African trade is the still widespread existence of tariffs and customs (African Union Commission (ed.), 2013, 155-158). Another obstacle to trade are inefficient customs authorities as the World Bank's Burden of Customs Procedures Index [6] shows (Figure 4.5). In comparison to industrialized countries such as Germany, the United States, and the EMU, African countries reach considerably worse index values, with ECCAS and UMA achieving the worst ratings.

The data presented in this section have a major drawback. The data includes only official merchandise trade. Hence, the internal trade flows calculated here neither include trade of services nor informal trade across Africa's long and permeable national border lines. While trade of services is likely very limited, Foroutan and Pritchett (1993) estimate informal trade to be about equally as high as the officially reported trade. Hence, looking at official trade only understates potential benefits of African monetary unions and overstates their costs. Nonetheless, even doubling the share of intra-REC and intra-African trade would still leave it by far exceeded by international trade.

[5] African countries' intra-REC trade flows are calculated by aggregating bilateral trade flows with the remaining REC member states. Data on bilateral and multilateral trade flows is obtained from the IMF Directions of Trade Statistics which cover merchandise trade only. Some countries' calculations are marginally distorted downwards as bilateral trade data with very small countries, in particular with the small island countries, is not available. The trade with the rest of the world is calculated as overall trade less trade with Africa and the trade with the rest of Africa is calculated as the trade with Africa less the trade with the respective REC.

[6] The Burden of Customs Procedures Index measures business executives' perceptions of their country's efficiency of customs procedures. The rating ranges from 1 to 7, with a higher score indicating greater efficiency. (The World Bank (ed.), 2015)

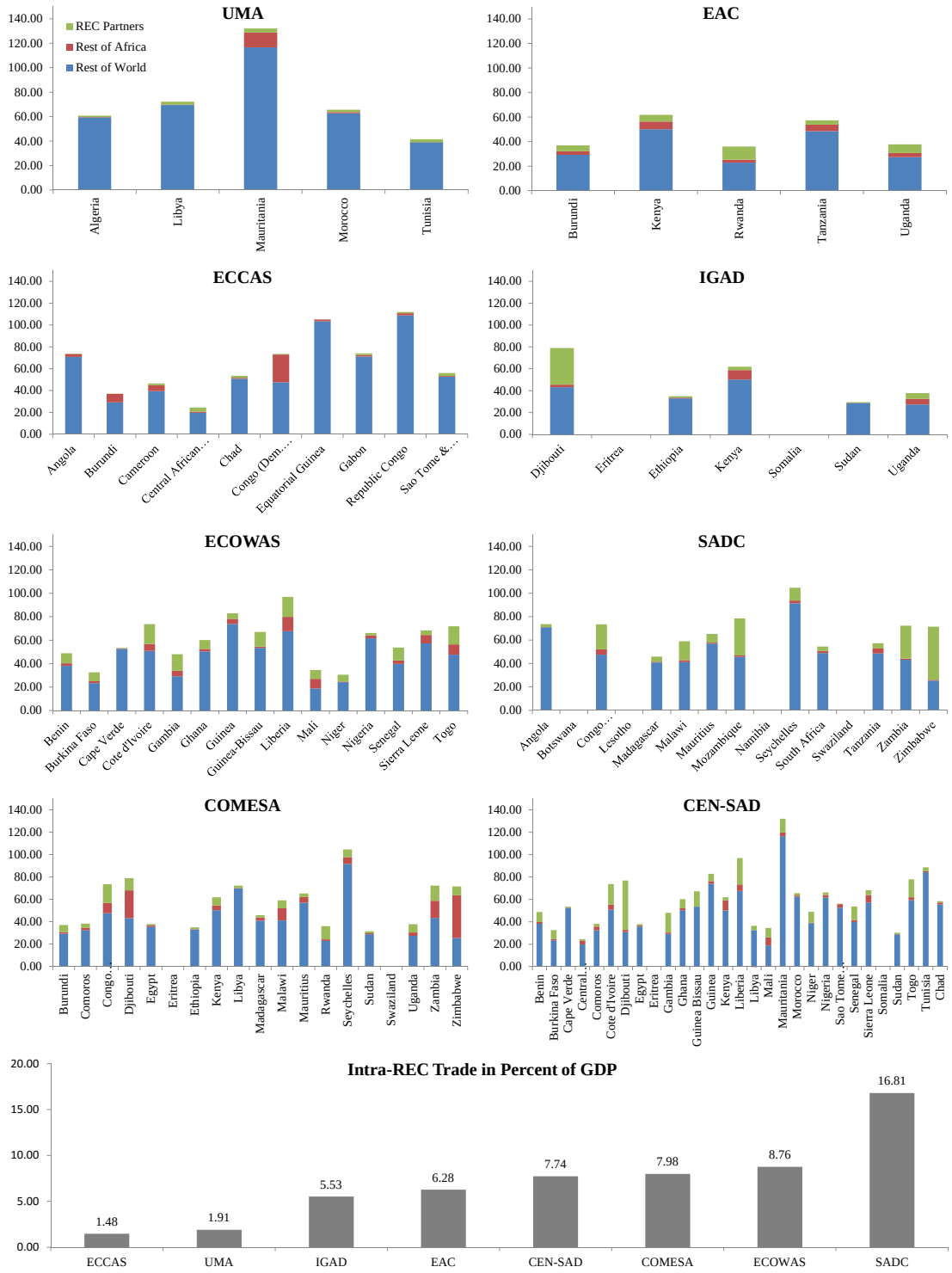

Figure 4.4.: Openness of REC countries.

Note: Openness (upper charts): Sum of nominal exports (free on board) and nominal imports (including costs, insurance, and fright) in percent of nominal GDP (2011). Intra-REC-Trade (lower chart): Arithmetic average (weighted with trade shares) of member country trade with REC partners in percent of GDP. Scales varying. Graph missing for Botswana, Djibouti, Eritrea, Lesotho, Libya, Namibia, Somalia, and Swaziland owing to insufficient data. Sudan excluding South Sudan.
Source: IMF Directions of Trade Statistics, World Bank World Development Indicators, own figure and calculations.

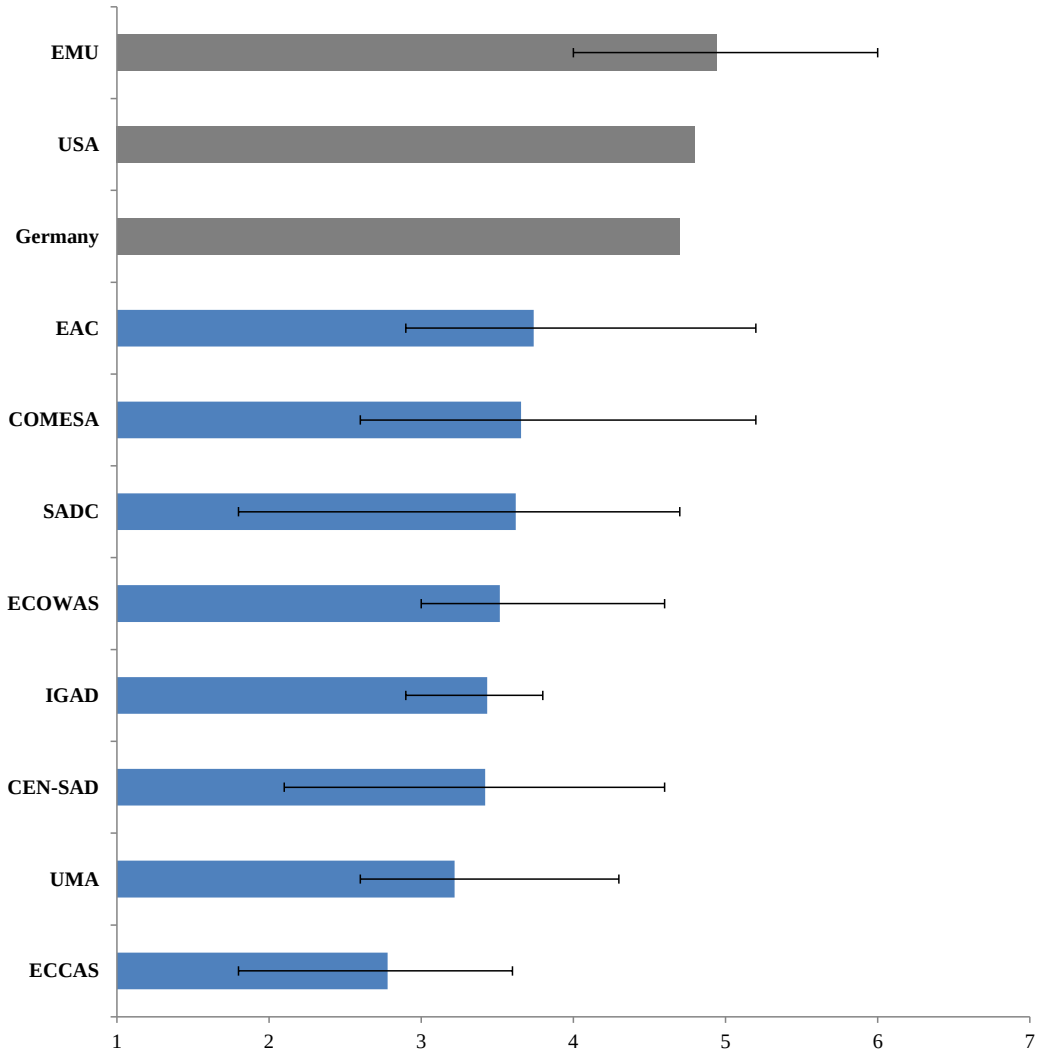

Figure 4.5.: Burden of Customs Procedures Index

Note: Maximum, minimum, and unweighted arithmetic averages of the World Bank's Burden of Custom Procedure Index of 2014 of REC member countries. Index values rage between 1 for extremely inefficient and 7 for extremely efficient. The Central African Republic, Comoros, Congo (Dem. Rep.), Congo (Rep.), Djibouti, Equatorial Guinea, Eritrea, Guinea-Bissau, Niger, Sao Tome and Principe, South Sudan, Sudan, Togo, and Western Sahara are excluded from calculations owing to lack of data. Ordering from the top of the chart with the country/region with the best score to the country/region with the worst score.
Source: World Bank, own figure and calculations.

4.4.2. Export diversification

As described in chapter 3, one source of asymmetric shocks or asymmetric reactions to common shocks are sector-specific shocks – in particular, when sectors are spread uneven between monetary union member states and trade is primarily inter-industrial. Sector-specific shocks may have a domestic origin or could come from abroad, for instance from export markets. If demand con-

ditions for particular export goods change and a member state heavily relies on that good and possibly on only a few export partners, the shock consequences might assume macroeconomic proportions. A supranational central bank might be condemned to little or no counter-action if the shocks only hit one member state while others are unaffected. Therefore, the more diversified the exports of monetary union member states are, the less vulnerable are they to sector-specific shocks.

A measure of how diversified African economies' exports are is provided by the Export Diversification Index of the IMF (International Monetary Fund (ed.), 2014b). Its basic idea is not to measure diversification of exports but rather the concentration of exports by quantifying the inequality between export shares. Thus, higher index values indicate a higher concentration of exports on only few products and lower values indicate a higher degree of diversification. The Export Diversification Index is calculated as a Theil index (Theil, 1972). It is the sum of the intensive (within) and extensive (between) sub-indices. They are calculated by following the definitions and methods of Cadot, Carrere and Strauss-Kahn (2013). At first, dummy variables are created to define each product as a traditional-traded, a new-traded or a non-traded one. Traditional products are goods that were exported at the beginning of the observation period (for almost every country the observation started in 1962 and ended in 2010). Non-traded goods have zero exports for the entire sample. Thus, for each country and product, the dummy values for traditional and non-traded goods remain constant across all years of the sample. For each country/year/product group, products classified as new must have been non-traded in at least the two previous years and then exported in the two following years. Thus, the dummy values for new products may change over time. The extensive Theil index $T_{extensive}$ and intensive Theil index $T_{intensive}$ are calculated for a given country and year (country and time subscripts are omitted):

$$T_{extensive} = \sum_{k} \frac{N_k}{N} \frac{\mu_k}{\mu} ln\left(\frac{\mu_k}{\mu}\right) \tag{4.1}$$

$$T_{intensive} = \sum_{k} \frac{N_k}{N} \frac{\mu_k}{\mu} \left[\frac{1}{N_k} \sum_{i \in Ik} \frac{x_i}{\mu_k} ln\left(\frac{x_i}{\mu_k}\right)\right]. \tag{4.2}$$

The index k represents the group (traditional, new, and non-traded), N_k the total number of products exported in group k, μ the average export value of a product in US-Dollars, μ_k the average export value of product group k in US-Dollars, $\frac{\mu_k}{\mu}$ the relative mean of exports in each group and x_i the export value of exports good i in US-Dollar (International Monetary Fund (ed.), 2014c).

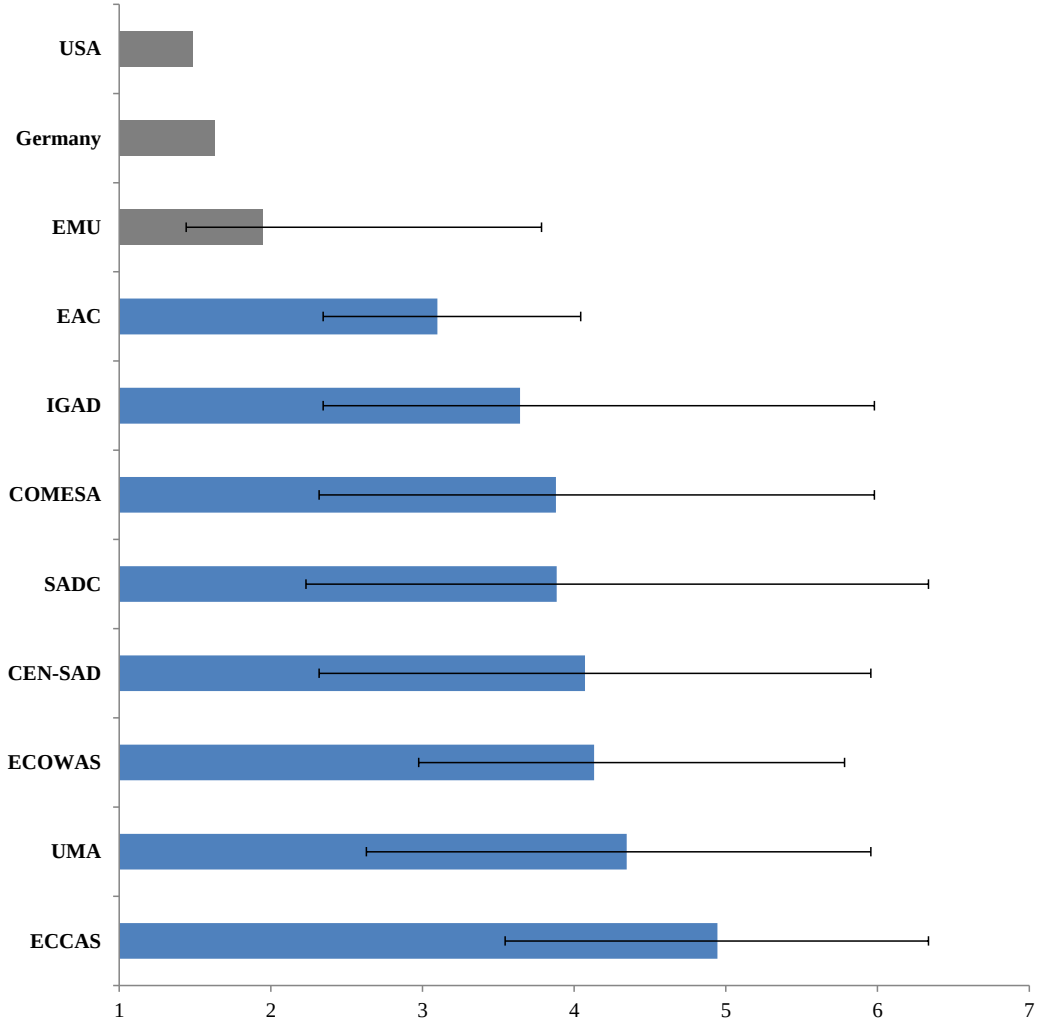

Figure 4.6.: Export Diversification Theil Indices

Note: Maximum, minimum and unweighted arithmetic averages of the IMF trade diversification index values of 2010 of REC member countries. Botswana, Namibia, Lesotho, Somalia, South Sudan, Swaziland, and Western Sahara, are excluded from calculations owing to lack of data. Germany, USA and EMU displayed for comparison. Ordering from the top of the chart with the country/region with the best score to the country/region with the worst score.
Source: International Monetary Fund, own figure and calculations.

The most recent value of the Trade Diversification Index published by the IMF is for 2010. The values are listed for all RECs and their member states – and, for comparison, the values for the EMU, Germany, and the United States – in the tables A.2 - A.5 in the appendix. Figure 4.6 summarizes them by showing the unweighted[7] arithmetic averages of the REC member

[7] Unweighted averages are calculated, because they represent the information on which an average REC member state has to base its decision on whether or not to join a regional monetary union. A weighted average would represent the information a collective decision would be based upon. However, every sovereign member state decides on an individual basis.

states as well as the minimum and maximum of member state's index values. The data show that, in general, African RECs exhibit much higher index values and variation than the industrialized countries Germany, the United States, and the EMU. Hence, African country's exports are significantly more concentrated on fewer exports goods. Moreover, African countries and regions differ greatly. But even the EAC, which has the most diversified exports among African RECs, is still far from index values exhibited by industrialized countries. Hence, the risk for African countries of falling victim to sector-specific shocks is considerably higher.

The major reasons for the low diversification of African exports are that many African economies lack a diversified industrial basis and access to world markets for various political and economic reasons. A considerable part of African economies consists of mere subsistence production with low value added and the extraction of natural resources. African countries mainly export primary commodities, such as crude oil, natural gas, ores, minerals, gold, diamonds, as well as unprocessed agricultural products, such as coffee beans, cotton, cocoa, caoutchouc, and tobacco, to industrialized nations.[8] Moreover, African economies are usually heavily reliant on just one or only very few specific export product(s) which makes them very vulnerable to shocks in their specific sector(s).

4.4.3. Interim conclusion

The trade data explored in this section point to the result that, at this level of trade integration between REC member states, a monetary union seems to be of limited benefit as transaction cost savings are rather small, even taking into account a possible trade increase induced by the monetary union itself. Moreover, the costs of a monetary union are probably very high at these low trade levels. Furthermore, the generally low degree of export diversification makes African Economies vulnerable to asymmetric shocks. However, the situation will probably change considerably for the better when the envisaged free trade areas are fully implemented and operational.

4.5. Synchronicity of business cycles

The degree of synchronization of member states' business cycles and macroeconomic shocks is a crucial factor in determining the costs of monetary union membership, i.e., the costs decrease

[8] The Observatory of Economic Complexity of the Massachusetts Institute of Technology gives very detailed statistics of the composition of exports of African (and other) nations as well as their trading partners (Observatory of Economic Complexity (ed.)).

the more synchronized they are (see chapter 3). The following section deploys different empirical methods to determine how synchronized African economies are and whether there is any evidence that the economic integration efforts since the Abuja treaty went into force have helped equalizing national business cycles.

4.5.1. Simple correlations

In order to get an indication of how synchronized the business cycles of REC members are, it is useful to take a look at the correlation of their real GDP growth rates and inflation rates (GDP deflator). These variables serve as observable proxies for the changes in macroeconomic output and price level in a dynamic aggregated demand - aggregated supply model setting. To get measures of synchronicity, the correlation coefficients ρ are calculated for every member state of every REC (equation 4.3) between the real GDP growth rate y or inflation rate of a member state i and an aggregate of the remaining REC member states $-i$.

$$\rho(y_t^i, y_t^{-i}) = \frac{\sum_{t=1}^{n}(y_t^i - \bar{y}^i)(y_{t-k}^{-i} - \bar{y}^{-i})}{\sqrt[2]{\sum_{t=1}^{n}(y_t^i - \bar{y}^i)^2 (y_t^{-i} - \bar{y}^{-i})^2}} \tag{4.3}$$

Since the calculation of the correlation coefficient includes mean centering of the respective GDP growth or inflation rates, it provides a measure of synchronicity of fluctuations around the average rate of change, i.e., a proxy for deviations from the dynamic equilibrium of aggregated demand and aggregated supply. Moreover, the correlation coefficients are tested for significance using the Ljung-Box Q-Test (Ljung and Box, 1978) with the Null hypothesis of no significant correlation. A high, positive and significant *rho* indicates that the pertained member state's business cycle is highly synchronized with that of the rest of the REC and the costs of monetary union are rather low. Since the Abuja treaty went into force in 1994 two correlation coefficients, pre- and post-1994, are calculated to test if synchronicity has increased since then.

Prior to the calculation of the correlation coefficients the time series of GDP growth and inflation rates are tested for non-stationarity. Because the correlation coefficients of growth rates (their calculation involves computing the first differences) are calculated, non-stationarity of order one in the level data is not a problem for statistical inference. If the level data are, however, integrated of order two[9], the growth rates would still be integrated of order one and the calculated correlation

[9] In the long run, non-stationarity of an order higher than one is very unlikely but could occur for a limited period of time and, hence, in the samples used here.

might be spurious. In order to rule out spurious correlation results, the time series of the growth rates of GDP and the GDP deflator are tested for non-stationarity using the Augmented Dickey-Fuller Test (Dickey and Fuller 1979, 1981, and Dickey and Said 1984) in three test specifications – testing for a deterministic trend, a random walk with drift, and a random walk – with the length of auto-regressive lags determined on the basis of the Bayesian Information Criterion (Schwarz, 1978). However, the Augmented Dickey-Fuller Test tends to erroneously not rejecting the null hypothesis of non-stationarity in the presence of structural breaks (Perron, 1989). Therefore, if the Augmented Dickey-Fuller Test does not reject non-stationarity, the Zivot-Andrews Test (Zivot and Andrews, 2002), which tests the null hypothesis of non-stationarity while allowing and testing for one structural break (in constant, trend or both), is applied as well. The length of autoregressive lags is also determined on the basis of the Bayesian Information Criterion. For three time series the null hypothesis could not be rejected in this two-step procedure, namely, the growth rates of the GDP deflator of Eritrea, Sudan, and Zambia. The tests identify a deterministic trend in all three series. Since the Zivot-Andrews Test only allows for one structural break, those series might exhibit more than one break which leads to the non-rejection of the null hypothesis. Therefore, for these three series the Lee-Strazicich Test (Lee and Strazicich, 2003), which tests the null hypothesis of trend non-stationarity allowing for two structural breaks, is performed with the length of autoregressive lags chosen by the general to specific method. For the concerned series, the Lee-Strazicich Test rejected the null hypothesis and adopted the alternative hypothesis of trend stationarity with two structural breaks. Therefore, the result of the stationarity tests is that, none of the time series is significantly identified as non-stationary. Moreover, since the aggregation of stationary series, leads to another stationary series there is no need to test for non-stationarity in the REC aggregates as well. Hence, the significance calculated correlation coefficients are not the spurious result of trending variables.

The detailed results of the correlation analyses are presented in tables A.6 - A.9 in the appendix. Figure 4.7 summarizes them by displaying the unweighted average of member states' correlation coefficients of each REC as well as the rage between the highest and the lowest correlation coefficient exhibited by member countries. The general result is that none of the RECs exhibits a high degree of synchronicity since all average correlation coefficients remain well below 0.6[10] while

[10]The value of a correlation coefficient lies between -1 and +1. A value of -1 indicates a perfectly negative linear relationship, a value of +1 a perfectly positive linear relationship. In practical empirical work, values above 0.6 are often considered to indicate a strong positive relationship. However, that value is ultimately arbitrary (Quatember, 2005, 67).

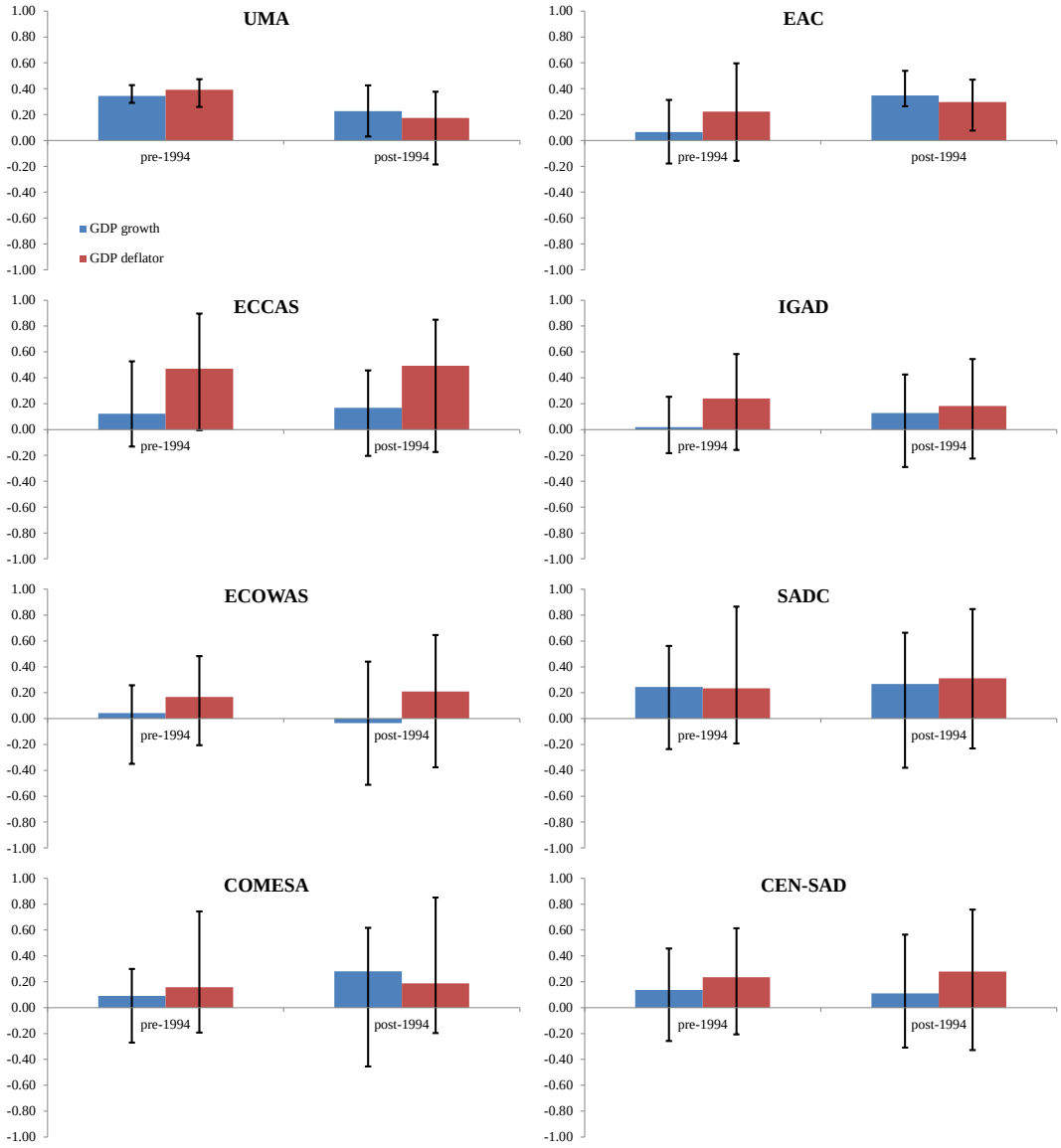

Figure 4.7.: Average correlation of GDP growth and inflation rates in RECs pre- and post-1994.

Note: Maximum, minimum and unweighted arithmetic averages of correlation coefficients of member countries with the aggregate of the remaining REC of year-over-year GDP growth and inflation rates (GDP deflator). Somalia, South Sudan, Western Sahara, and Eritrea (prior to 1994) are excluded from calculations owing to insufficient data. Calculations of correlation coefficients for UMA, COMESA, and CEN-SAD end in 2010 because of the Libya war and the Arab spring revolutions.
Source: Own figure and calculations.

the Q-test results are, on average, not significant on a five percent level. However, there are considerable differences between the RECs, between individual member states (some even have negative correlation), between GDP growth and inflation rate synchronicity, and between the pre- and post-1994 periods. Of all RECs the ECCAS exhibits the highest degree of inflation rate synchronicity which is not surprising since six of its ten members are part of the CFA franc zone (CAEMU).

A similar result might have been expected of the ECOWAS which is among those RECs with the lowest degree of synchronicity. However, as Nigeria as a non-member state of the CFA zone accounts for about two thirds of GDP, the combined weight of the CFA member states (WAEMU) is small. Another example of the possibly positive influence of sub-REC groupings is the SADC. Its correlation coefficients of GDP growth and inflation are high compared to other RECs (but still low in absolute terms). This is possibly the result of the CMA and the SACU membership of some of its member states as well as the gravitational force of South Africa which accounts for about two thirds of the SADC's aggregate GDP. The SADC also managed to increase its average synchronicity since 1994 while that of individual member states greatly differs. Besides the SADC, only COMESA and the EAC substantially increased their synchronicity since 1994. In the case of EAC that is likely the result of its comparatively successful integration policy (see Table 2.1). Moreover, it is the only REC that narrowed the rage between the highest and lowest correlation coefficient indicating a relatively equally distributed convergence process of its member states' economies. As a striking counterexample, UMA's synchronicity considerably declined, likely as a result of the stalled regional integration owing to the unresolved political conflicts over the status of the Western Sahara which caused Morocco's departure from the OAU/AU[11]. The remaining RECs approximately maintained their degree of synchronicity reflecting the little progress made in regional integration. However, the generally increased range between member states' correlation coefficients indicates a divergence between member states. This is probably the result of the fact that only some African countries, as major exporters of primary commodities, became more integrated in the world economy during the last two decades while other countries were left behind.

4.5.2. Output gap correlations

The analyses of correlations of GDP growth and inflation rates give a first impression of the synchronicity of economic cycles in African regions. However, they are incapable of showing how pronounced booms and recessions are and how long national economies need to return to their usual degrees of capacity utilization. The output gap (equation 4.4), which is defined as the percentage difference between actual GDP y and potential GDP $\tilde{y}$, makes such comparisons possible.

$$gap = \frac{y - \tilde{y}}{\tilde{y}} \cdot 100 \tag{4.4}$$

[11] To avoid distortions of the correlation coefficients owing to the war in Libya as well as civil conflicts and political insecurity in some African states in the wake and aftermath of the Arab spring revolutions, the sample periods of UMA, CEN-SAD, and COMESA end at 2010 instead of 2012.

The potential GDP is the real output that an economy is capable to produce sustainably[12]. Its level is determined by the structure of production, the state of technology, and the available production factors[13]. Its growth rate is driven by the speed of technological advancement and the net (after depreciation) increase of input factors. The theoretical reasons for the divergence of actual output from potential production are wage and price rigidities which prevent the immediate clearing of markets and temporary deviations because the economic agents need time to adjust after random productivity shocks (real business cycles) (European Central Bank (ed.), 2000, 37-38).

The difficulty in calculating output gaps is the statistical measurement of the potential output. Since it is not observable, it can only be estimated. There are various methods proposed in economic literature to measure the potential GDP which can be divided into two categories: the production function approach and statistical methods. The former calculates the potential output by explicitly modeling the supply side of an economy using a macroeconomic production function and estimates its components, i.e., capital, labor, and the level of technology. The production function approach has the advantage of supplying a dis-aggregated picture of the potential output which enables an analysis of its determinants. However, the production function approach suffers from serious data problems and relies heavily on (necessary) assumptions which makes it very elaborate and difficult to derive Moreover, errors in components may compound when calculating the potential output. Statistical methods are much simpler and rest on fewer assumptions. They apply different statistical techniques to decompose a time series of the output variable into a trend and cyclical component. While the first represents the underlying long-term development of the output, i.e., it is an estimate of the potential output, the latter accounts for short-term deviations from its long-term path. The simplest possible approach would be to fit a linear deterministic trend trough the time series data of the growth rate of the real output variable. The output gap then would be the deviation from the trend. That, however, would assume a constant trend growth rate over time which disregards developments on the supply side of the economy. Testing for and modeling of structural breaks in the trend is a possible way to overcome this limitation. Since it is imperative for the linear trend approach to measure the trend growth over at least one full economic cycle, modeling breaks that occur within a cycle would distort the estimate of the trend

[12] The potential output describes the level of output that an economy produces when production factors are used at their normal capacity utilization level. At the normal utilization level, the marginal benefits equal the marginal costs of the use of an input factor.

[13] The size of the labor force is determined by the labor participation rate, the share of the working age population of the total population, the usual degree of unemployment, and population growth. The size of the capital stock is determined by past investments and the rate of depreciation.

growth rate, before and after the break. This seriously limits the ability of this technique to derive reliable estimates of the trend path. A more refined method of decomposing time series into its latent trend and cyclical components are statistical filters. There are several filter techniques commonly used in macroeconomic time series analyses. The Christiano-Fitzgerald-Filter (Christiano and Fitzgerald, 2003, 437-447), the Baxter-King-Filter (Baxter and King, 1999, 576-583), and the Hodrick-Presscott (HP)-Filter (Hodrick and Prescott, 1997, 3-7) are among the most frequently applied (European Central Bank (ed.), 2000, 37-41).

Since for the purpose of this study it is not necessary to analyze the underlying determinants of the potential output, this study resorts to statistical methods instead of the production function approach. To avoid the described difficulties of using a linear deterministic trend, filter methods seem more appropriate. Among the various filters the HP-Filter is chosen since it is the most commonly used in estimates of the potential output by leading institutions' research departments such as the European Commission's Directorate General for Economic and Financial Affairs and the Organization for Economic Co-operation and Development. Moreover, Nilsson and Gyomai (2011, 13-22) have shown that the HP-Filter is superior to Christiano-Fitzgerald-Filter in identifying turning points of economic cycles, a feature, which is essential for the determination of business cycle synchronicity. The HP-Filter was (re-)developed[14] by Hodrick and Prescott (1997) for an empirical study on the business cycles of the United States. The basic intuition is to decompose the logarithm of the time series data of real GDP y into its underlying trend g and cyclical c components by finding the trend or growth component g which minimizes the sum of squared deviations of actual output (equation 4.5) from its trend subject to a constraint on the variation of the growth rate of trend output. In essence, the HP-filtering of a GDP time series delivers a new time series that is very similar to a symmetric weighted moving average of the original time series, called the trend component of the GDP. The trend GDP series is an estimate of the potential output that is used in this study to calculate the output gaps of African countries and country aggregates according to equation 4.4.[15]

$$\min_{\{g_t\}_{t=-1}^{T}} \{\sum_{t=1}^{T}(y_t - g_t)^2 + \lambda \sum_{t=1}^{T}[(g_t - g_{t-1}) - (g_{t-1} - g_{t-2})]^2\} \tag{4.5}$$

[14] Other authors developed similar filter techniques prior to Hodrick and Presscott. See for instance (Leser, 1961)

[15] Consider an idealized, macroeconomic output time series that (when plotted) looks like an upward trending sinusoidal curve. The HP-Filter delivers a new time series that (when plotted) runs exactly through the middle of the amplitudes of the upward trending sinusoidal curve. The difference between both time series (distances between both graphs) are the gaps between the actual production and the production potential.

The first term of equation 4.5, the sum over the squared deviations of the observed values of y from the permanent trend g, represents the goodness of the fit while the second term penalizes variability in the trend component series. The positive parameter λ is the weight of the penalty and, hence, controls the smoothness of the fit. If λ goes to infinity, g approaches a linear trend and if λ goes to zero, g approaches the observed values of y. Hodrick and Prescott (1997) apply a value of 1600 for λ, however, the value is ultimately arbitrary and involves assumptions on the typical length of business cycles. If it is set too low or too high, parts of the actual cyclical component could mistakenly be estimated as trend component and vice versa. However, Hodrick and Prescott (1997) found that their results are not very sensitive to changes in λ by altering it to 400 and 6400. Since Hodrick and Prescott (1997) use quarterly data, their proposed value for λ of 1600 is not appropriate for the annual data used here. Ravn and Uhlig (2002) suggest a value of 6.25, Stamfort (2005) a value of 6.65, Maravall and Rio (2001) a value between 6 and 7 while Baxter and King (1999) use a value of 10 for annual data. For the following estimations of potential GDP a λ value of 7 is used which is approximately the average of the values proposed in the literature and corresponds to a λ of 1600 for quarterly data and to a reference length of an economic cycle of 9.9 years (Maravall and Rio, 2001, 37-38).

In addition to setting the appropriate value of λ, the HP-Filter suffers from other technical difficulties. One is the poor reliability of the end of sample estimates because it is lacking the information of the future path of the underlying series (European Central Bank (ed.), 2000, 40-41). To deal with this shortcoming, the time series of the real GDP is extended for three years with forecasted values generated by a univariate autoregressive model with up to two lags that is estimated based on the full sample. Another serious issue are structural breaks in the level or growth rate of potential output. If not taken into account, the HP-Filter mistakenly treats breaks as cyclical fluctuations and smooths them by adjusting the trend component even before the break occurs, leading to misleading measures of the cyclical position of the economy (output gap) around the breakpoint (European Central Bank (ed.), 2000, 41). One possible way to address this problem is to incorporate structural breaks into the filtering by adopting a piece wise approach, i.e., separate estimations according to equation 4.5 for the periods before and after a breakpoint and linking those. However, before breaks can be modeled, it is necessary to firstly identify the type and timing of structural breaks in the path of potential output. In order to achieve that, one could estimate simple univariate autoregressive models, possibly incorporating deterministic trends and use tests for structural breaks in the model, such as the Andrews-Ploberger test for breaks at unknown date

(Andrews and Ploberger, 1994). However, the structural breaks found by the test cannot differentiate between breaks in the underlying path of the potential output or just extreme cyclical effects or temporary exogenous shocks which do not alter the potential output. Moreover, simple autoregressive models are probably not capable of sufficiently explaining real output which possibly leads to the miss-identification of structural breaks that are actually normal results of the underlying data-generating process. Therefore, to avoid mis-identifications of structural breaks in the path of potential output and, hence, distortions of the calculated output gaps, the study refrains from formally testing for structural breaks. Instead, breaks in potential output are identified manually[16] based on historical information of events that affect either the level or the growth rate of potential output. Such events are primarily internal and external conflicts or changes in legislation which either rather instantaneously reduce human and physical capital (downward shift in potential output) or slowly over time (lower or negative trend growth rate).

The detailed correlation coefficients for individual countries are presented in tables A.10 - A.13 in the appendix. Figure 4.8 summarizes them by displaying the unweighted average of member states' correlation coefficients of each REC as well as the rage between the highest and the lowest correlation coefficient exhibited by member countries. In terms of business cycle synchronicity, the results are in line with the outcome of the simple correlation analyses, i.e., synchronicity of REC member states' business cycles is rather low and in the majority of countries not significantly different from zero. Moreover, most RECs were not able to make substantial progress since the Abuja treaty went into force in 1994. UMA's synchronicity even slightly declined. A notable exception is the EAC which ascended from the lowest average correlation of all RECs prior to 1994 to the highest for the post-1994 period, though still below a value which can be considered as indicating a high and positive correlation. In addition, the output gap analysis confirms another the result of the simple correlation analysis: in almost all RECs the range between the highest and the lowest correlation coefficients of REC member states did not decline after 1994, it even increased considerably in COMESA and ECOWAS, indicating different speeds of progress and even regress in some member states. Besides allowing the evaluation of synchronicity, the calculation of output gaps allows to evaluate the severity of business cycle deviations by measuring the amplitudes of variations. Tables A.10 - A.13 list the differences in standard deviation as well as the minimum and

[16] Structural breaks are identified by visually checking time series data for considerable changes. They are treated as structural breaks when historical information suggests that events in that country likely caused changes in potential output. For instance, when military conflicts lead to a considerable reduction of the labor force because people fled the country.

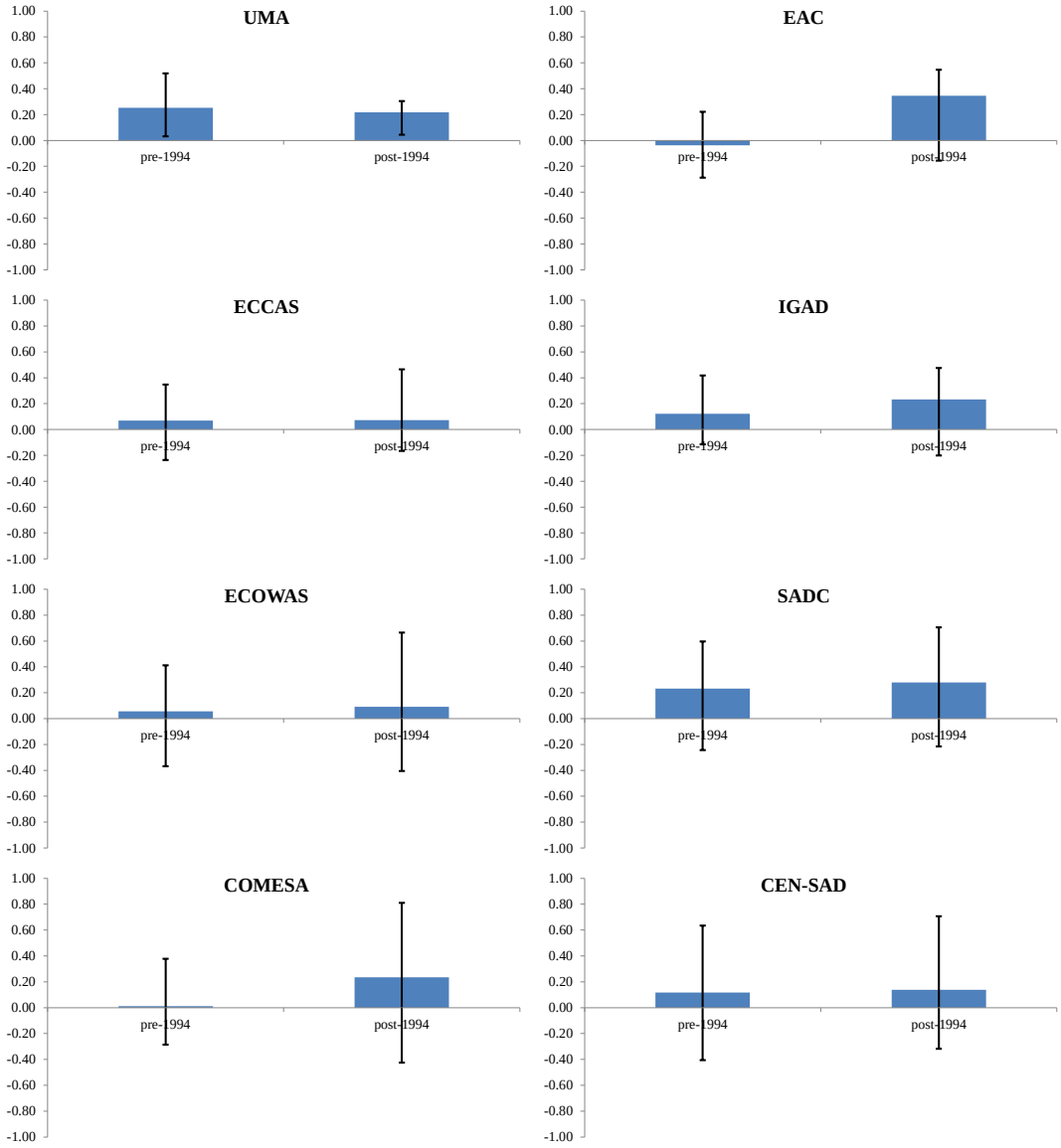

Figure 4.8.: Average correlation of output gaps in RECs pre- and post-1994.

Note: Maximum, minimum and unweighted arithmetic averages of correlation coefficients of member countries' output gaps with the output gaps of the aggregate of the remaining REC. Somalia, South Sudan, Western Sahara, and Eritrea (prior to 1994) are excluded from calculations owing to insufficient data. Calculations of correlation coefficients for UMA, COMESA, and CEN-SAD end in 2010 because of the Libya war and the Arab spring revolutions. Source: Own figure and calculations.

maximum of national output gaps and the aggregate of the remaining REC countries. Moreover, the REC's averages are calculated as the average absolute values of member states' differences in standard deviation, minimum, and maximum. The calculations demonstrate that, in addition to low synchronicity, deviations of national business cycles in comparison to the remainder of the REC are fairly severe. On average, during the pre-1994 period, member states usually deviate

about one and a half percentage points from the output gap of its fellow REC partners. However, in the post-1994 period, the severity of business cycle deviations declined in most RECs, except for CEN-SAD, ECCAS, and ECOWAS. Here, also the EAC exhibits one of the best performances and significant progress since the Abuja treaty's ratification. This is likely to some extend the result of the comparatively successful regional integration process but maybe also the reflection of the great moderation[17] in industrial countries until 2008 as major trading partners and a general progress in Africa towards fewer internal and external conflicts and democratization.

4.5.3. Evidence on the endogeneity of business cycle synchronicity

The empirical investigations have shown so far that one of the major preconditions for a beneficial monetary union, a high degree of business cycle synchronicity and similarity of shocks, is not fulfilled in any REC. However, forming a monetary union might itself have a positive impact on synchronicity. One of the channels that might foster business cycle synchronicity is through increased trade (trade channel). As transaction costs decline by using a common currency, trade is likely to increase. Moreover, it eliminates national monetary policies as a possible source of asymmetric shocks. It limits the scope for national fiscal policy shocks as countries cannot get indebted in their own national currency (policy channel). However, since monetary union membership limits fiscal authorities' capabilities to counter shocks by taking an expansive policy stance as well as the limitations of monetary policy in case of asymmetric shocks, the net effect of monetary union membership on synchronization might even be negative.

As a first indicator, the experience of the already existing African monetary unions and sub-RECs, the CMA, the WAEMU, and the CAEMU can be used to assess whether the net effect is positive or negative, if there is any at all. Therefore, the same calculation for the correlation of output gaps, GDP growth and inflation rates is conducted for the three existing African monetary unions. The detailed results are displayed in tables A.14 and A.15 in the appendix. Figure 4.9 summarizes the results by portraying the average correlation coefficients as well as the minimum and maximum of correlation coefficients of individual member states for the pre- and post-1994 periods. The results indicate that inflation rates are considerably higher correlated which is to be expected when having a common monetary policy. However, the development of the real economy seems not to be significantly higher or lower correlated between monetary union member

[17] The term Great Moderation denotes a period of historically low volatility in macroeconomic variables, such as GDP and inflation in developed nations commencing in the mid-1980 and ending with the Great Recession in 2008 and 2009. The term was coined by J. H. Stock M. W. Watson (2002).

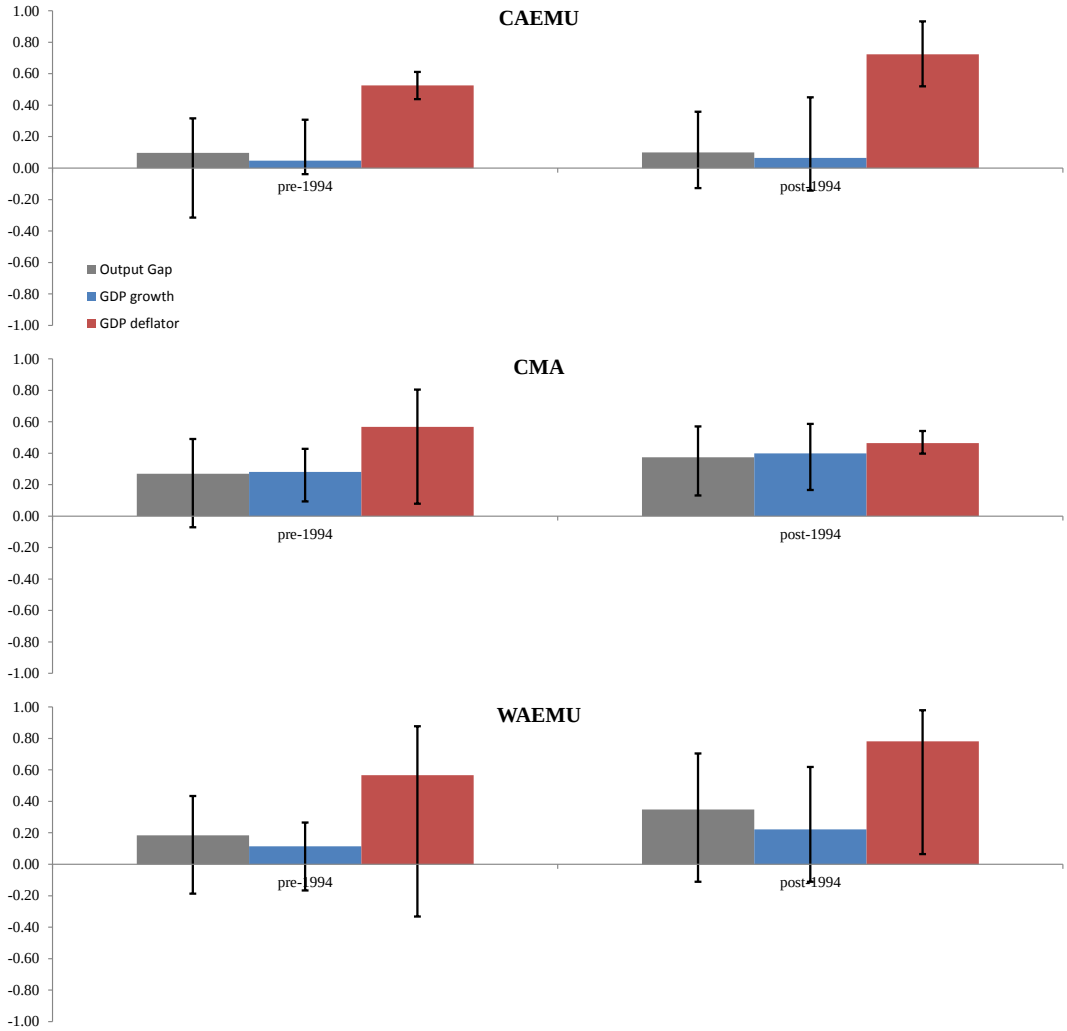

Figure 4.9.: Average correlation of output gaps, GDP growth, and inflation rates in existing African monetary unions pre- and post-1994.

Note: Maximum, minimum, and unweighted arithmetic averages of correlation coefficients of member countries' output gaps, GDP growth, and inflation rates with the output gaps, GDP growth, and inflation rates of the aggregate of the remaining monetary union member states.
Source: Own figure and calculations.

states than between monetarily independent countries of the same REC. Moreover, there is no clear indication that the differences in business cycle positions are less pronounced. However, the greater synchronicity of the CMA compared to the CFA zones might speak for a possibly positive effect of having relinquished internal trade restrictions since the CMA members are also members of the same customs union (SACU). However, this might be to some degree the result of the high economic gravity of South Africa which accounts for over 95 percent of CMA's GDP. Until Namibia's independence in 1990, it was even an integral part of South Africa. CAEMU and

WAEMU also became customs unions in 1994. However, only WAEMU managed to increase its business cycle synchronicity since then.

These indistinct results call for a more comprehensive analysis of the effects of monetary union membership on the degree of business cycle synchronicity, if there is any at all. Therefore, a panel estimation is run which encompasses 44 African nations[18] and the period of 1964 to 2012 partitioned into two periods, pre- and post-1994. It is based on annual data from the World Bank World Development Indicators database and the International Monetary Funds Directions of Trade database as described above. The panel model (equation 4.6) regresses bilateral correlation coefficients ρ of two countries' output gaps on monetary union membership MU to measure the effect of the policy channel and a set of control variables. Monetary union membership is measured with two different variables: a dummy variable which assumes a value of one if both countries are part of the same monetary union and zero otherwise as well as the number of years both countries are in the same monetary union[19]. To control for other possible factors, the following variables are added to the model: the bilateral trade volumes (imports plus exports) in percent of GDP ($TradeGDP$) to capture the effect of mutual trade integration (trade channel) on business cycle synchronicity[20], the linear distance between the geographical centers of the two countries $Dist$ in 1000 kilometers[21] to account for common regional shocks such as droughts and spillovers from (civil) wars, a common language dummy $ComLang$ which assumes the value of one when both countries have the same official language[22] to take possible (non-)existence of language barriers into account as well as possible still existing ties[23] from colonial times among the concerned countries as well as to the

[18] The nations included are Algeria, Benin, Burkina-Faso, Burundi, Cameroon, Cape-Verde, Central African Republic, Chad, Congo, Democratic Republic of Congo, Côte d'Ivoire, Djibouti, Egypt, Equatorial Guinea, Ethiopia, Gabon, The Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Liberia, Libya, Madagascar, Malawi, Mali, Mauritania, Mauritius, Morocco, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Seychelles, Sierra Leone, Sudan, Tanzania, Togo, Tunisia, Uganda, Zambia, and Zimbabwe. The data set is limited to African countries only because these are the countries for which inference is made and policy recommendations are derived. Given the size of the sample, except for a number of country pairs were only insufficient data are available, it comes close to representing the whole "population" of all African country pairs. The inclusion other countries would possibly lead to different estimation results owing to cross-country heterogeneity which might not be fully captured by the deployed panel estimation techniques and control variables. For example, the level of trade integration is much higher between, for instance, European countries. Also geographical distances are much lower and traffic infrastructure is more developed. Moreover, the pace of political and economic integration in the European (Monetary) Union is most likely considerably faster than in the African Union.

[19] The number of years is calculated as the sum of years before the respective time period in the panel (i.e., pre- or post-1994) and the average years during the respective time period in the panel.

[20] The drawback of that approach is that it does not capture third country effects. For instance, when both countries trade heavily with the same partner but not with each other, the synchronicity is likely to be positively impacted as well.

[21] Linear distance data gathered from http://www.luftlinie.org.

[22] A considerable number of countries have several official languages which all count for the setting the dummy variables value to one.

[23] These ties could be of different nature such as bilateral trade agreements but also, inter alia, similarity of political

former colonizer. Moreover, to control for a possible effect of free trade area agreements, FTA is added to the regression model as well – measured analogous to the monetary union membership as a dummy and number of years variable.

$$\rho_{it} = \beta_0 + \beta_1 MU_{it} + \beta_2 FTA_{it} + \beta_3 ComLang_{it} + \beta_4 Dist_{it} + \beta_5 TradeGDP_{it} + u_{it} \quad (4.6)$$

The subscript i represents the country pair and t the time period. The variable u denotes the error term and β_0 the constant term. To further control for the relevance of political stability for business cycle synchronicity, the Political Stability and Absence of Violence Index *PolStabInd* from the World Bank Worldwide Governance Indicators database is added. The indicator is measured in units of a standard normal distribution with a mean of zero, a standard deviation of one, and values running from approximately -2.5 to 2.5. Higher values of the index correspond to higher political stability (World Bank (ed.), 2014). Unfortunately, this indicator is only available for the post-1994 period. Therefore, the post-1994 data of the panel is used for a cross-country regression[24] which incorporates the minimum, average or maximum of the political stability indicator. The regression equation then takes the following form:

$$\rho_i = \beta_0 + \beta_1 MU_i + \beta_2 FTA_i + \beta_3 ComLang_i + \beta_4 Dist_i + \beta_5 TradeGDP_i + \beta_6 PolStabInd_i + u_i. \quad (4.7)$$

Equation 4.6 is estimated using random effects[25] with time-specific effects, country-pair-specific effects, and both effects as all effects are possible. The estimation results are displayed in Table 4.1. Based on the Schwarz-Bayesian Information Criterion[26] SIC (Schwarz, 1978), the random effects model that allows for country and time specific effects and use the years in monetary union variable is the superior model.[27] The estimation results show that, when allowing for country-

institutions, justice systems, and the organization of their labor markets.

[24] This approach has the disadvantage of not modeling country specific effects with the possible result of an omitted variable bias. However, coefficient estimates do not differ much from the panel results, except for the constant term.

[25] The random effects modeling is chosen because $ComLang_{it}$ and $Dist_{it}$ are time-invariant regressors which fixed-effects models, that uses the variation of one observation objects over time for estimation (within estimator), cannot handle.

[26] The SIC criterion is commonly used for model selection. In contrast to the coefficient of determination R^2, the SIC does only indicate that a model is superior to another model if additional contribute significantly to explaining the variation of the regressand. It does so by penalizing the number of parameters of model. Only if the increase in the likelihood is substantial enough to outweigh the penalty, the SIC indicates an improvement of a model. There are other selection criteria commonly used, like the Akaike criterion, but the SIC is stricter (i.e. the penalty for additional regressors is higher).

[27] The Breusch-Pagan tests for heterogeneity reject the null hypothesis of homogeneity and therefore poolability with respect to country and time specific effects. That result seems plausible since, with respect to time specific effects, the institutional setting changed significantly with the introduction of the African Economic Union in 1994. Regarding country specific effects it seems implausible to treat all 44 African nation as homogeneous since they are in

specific effects, bilateral business-cycle synchronicity significantly increases with every year both countries share a common currency. However, that effect is very small, i.e., on average, it takes about 150 years to increase the correlation coefficient by a mere 0.1[28]. The regression results also demonstrate that trade integration has a high and significantly positive effect on synchronicity[29] as has having a common language. As trade flows are expected to rise with monetary integration, as Rose (2000) confirmed empirically for the EMU, monetary union likely has an indirect effect on business cycle synchronicity as well. Free trade area agreements do not seem to have an additional impact on synchronicity apart from their indirect effect via increasing bilateral trade volumes. Distance and political stability also do not significantly affect the alignment of business cycles.

very different stages of development and have economic systems ranging from rather centrally planned economies to ones primarily organized as free-market economies.

[28] The effect is estimated as linear. When approaching a higher degree of synchronicity the effect is expected to become non-linear and converges to zero since the value of the dependent variable is limited to the interval of [-1,1].

[29] The effect is estimated as linear. The effect should become smaller with increasing trade integration. The estimated coefficient would lead to values of the correlation coefficient out of its interval when becoming too high. However such values are far out of the value range of the sample.

	Panel Model 1 (pooled OLS)		**Panel Model 2 (random effects)** *Time-specific effects*		**Panel Model 3 (random effects)** *Country-pair-specific effects*		**Panel Model 4 (random effects)** *Country-pair- and time-specific effects*		**Cross section model post 1994 (OLS)**		
Constant	0.04109*** (2,69)	0.04301*** (2,80)	0.04488*** (2,94)	0.046189*** (3,01)	0.04017*** (3,10)	0.04310*** (3,18)	0.04504*** (3,34)	0.04697*** (3,50)	0.09838*** (3,44)	0.08035*** (2,96)	0.06853*** (2,83)
Years Monetary union	0,00074 (1,62)		0,00067 (1,49)		0.00081** (2,08)		0.00068* (1,72)		0,00074 (1,37)	0,00079 (1,46)	0,00084 (1,56)
Years FTA	0,00390 (0,84)		0,00022 (0,05)		0,00503 (1,26)		0,00067 (0,16)		-0,00038 (0,08)	-0,00030 (0,06)	0,00034 (0,07)
MU dummy		0,01518 (0,48)		0,01844 (0,88)		0,01114 (0,58)		0,01424 (0,77)			
FTA dummy		0,03399 (0,92)		-0,00147 (0,04)		0,04287 (1,30)		0,00404 (0,12)			
Common language	0.03467*** (2,61)	0.03840*** (2,90)	0.03656*** (2,78)	0.03944*** (3,00)	0.03362*** (3,01)	0.03871*** (3,33)	0.03636*** (3,15)	0.04000*** (3,50)	0.04332** (2,28)	0.04234** (2,24)	0.04207** (2,22)
Distance	0,00179 (0,52)	0,00118 (0,34)	0,00090 (0,26)	0,00047 (0,13)	0,00199 (0,67)	0,00111 (0,36)	0,00085 (0,28)	0,00024 (0,08)	0,00097 (0,18)	0,00186 (0,35)	0,00354 (0,67)
Trade % of GDP	0.07554*** (3,41)	0.07686*** (3,40)	0.07077*** (3,20)	0.07286*** (0,13)	0.07705*** (4,05)	0.07782*** (3,90)	0.06995*** (3,56)	0.07197*** (3,61)	0.06023** (2,46)	0.06163** (2,50)	0.06319** (2,55)
PolStabInd (min)									0,01800 (1,40)		
PolStabInd (average)										0,00695 (0,44)	
PolStabInd (max)											-0,01121 (0,76)
Observations	1526	1526	1526	1526	1526	1526	1526	1526	851	851	851
Monetary union Obs.	171	171	171	171	171	171	171	171	93	93	93
Degrees of freedom	1520	1520	1520	1520	1520	1520	1520	1520	845	845	845
R^2	0,0217	0,0200	0,0394	0,0385	0,0188	0,0175	0,0421	0,0411	0,0226	0,0206	0,0210
SIC	0,0143	0,0161	0,0011	0,0022	0,0239	0,0164	-0,0019	0,0000	0,1475	0,1496	0,1491
Breusch-Pagan (p-value)	0.028**	0.032**	-	-	-	-	-	-	-	-	-

Table 4.1.: Regression results: Endogeneity of business cycle synchronicity

Note: Figures in parentheses are heteroscedasticity-consistent t-statistics. *** indicates significance at the 99% level, ** at the 95% level, and * at the 90% level.
Source: World Bank, Luftlinie.org, own table and calculations.

4.6. Shock responsiveness of prices

A quick response of prices and wages is imperative for monetary union member states to cope with asymmetric shocks and differing cyclical positions as nominal exchange rate adjustments are naturally ruled out. As seen above, African countries do not exhibit a sufficient degree of business cycle alignment, i.e., asymmetric shocks seem to be fairly common. Considering that empirical evidence presented above also points to the conclusion that monetary union memberships itself does not seem to meaningfully increase synchronicity, an African monetary union would be very costly in terms of lost output, higher unemployment, and worsening of the current accounts for some countries as other would experience an over-utilization of their resources and higher inflation. However, if prices exhibit a high degree of sensitivity to shocks, the costs of monetary union membership would be greatly mitigated as their economies would more swiftly return to their equilibrium growth paths. This section therefore attempts to empirically measure the degree of that responsiveness.

4.6.1. Excursion: The theory of price and wage rigidity

How responsive prices are to macroeconomic shocks is determined by the degree of price and wage flexibility on the microeconomic level. In ideal economic models, full price flexibility is often assumed. In reality, prices are not fully flexible. They exhibit a certain degree of rigidity or stickiness, in particular downwards. One rationale for companies to deviate from the profit-maximizing prices of their goods and services by not adjusting them instantaneously is that changing prices is costly (Barro (1972) and Sheshinski and Weiss (1977)). Determining the optimal price also requires gathering and processing information (Mankiw and Reis (2002) and Reis (2006)) which takes time and incurs costs. Companies therefore do not change their nominal price instantaneously to trace every small alteration of their optimal price. They rather let it vary between a lower and upper boundary. Within that interval, the deviation of the actual price from the optimal price is too small to cover the costs of changing prices. The result is that price changes are infrequent and large.[30] Another reason for price rigidity is that companies often prefer to set prices ending with a nine or to set round prices (Kashyap, 1995). Hence, prices are often not continuous and are therefore only changed to the next round number, leading to infrequent and rather large price changes as well. Moreover, companies might try to avoid setting prices that are viewed by

[30] This implies, that higher average inflation would lead to more frequent price changes.

their customers as unjustified (Rotemberg, 2011). This leads to higher rigidity of prices owing to changes in demand since customers are less willing to accept those in contrast to price alterations because of changes in costs. Moreover, price regulations are another source of inertia of prices as companies can adjust prices only after obtaining an administrative approval. Furthermore, sluggish price adjustments might also stem from the way economic agents form their expectations. If they are set backward-looking, prices probably react slowly to shocks that change their optimal price while forward-looking agents might react more timely if adjustments are appropriate given the adjustment costs (Dotsey, 2002).

Apart from the various sources of price rigidities, Dhyne et al. (2009) argue that it is important for monetary policy purposes to distinguish between intrinsic and extrinsic rigidities. Intrinsic rigidity describes the phenomenon that prices do not or merely partially adjust even to significant changes in demand or costs owing to reasons inherent to the price setting process as discussed above. Prices are denoted as extrinsically rigid when they do not adjust because demand and costs and therefore the optimal price are fairly stable. While the first is important for the adjustment after asymmetric shocks the latter, taken by itself, does not pose an obstacle to shock adjustment. It is, however, difficult to statistically measure both types of rigidities separately.

Aside from prices of goods and services, wages, as the prices of labor input, are a central cost factor for production and therefore a major driver of prices and inflation. Since wages also exhibit considerable nominal rigidity, they therefore add to the inertia of macroeconomic price indices. According to economic theory, the reasons for wage inflexibility are manifold. Taylor (1977) and Taylor (1980) identify long-term contracts which are only (re-)negotiated (collectively or individually) on a staggered basis as a significant source of rigid wages. Stiglitz sees another reason in risk averse workers' preference for stable real wages over the business cycle and firms offering that in return for wages below the value of the marginal product leading to an implicit contract to keep wages stable over the business cycle. Another rationale for companies adjusting nominal wages, especially downwards, is based on the theory that workers' productivity depends positively on their wage (efficiency wages) for several reasons. First of all, the higher wage is, the higher is the loss when losing the job because of shirking (Shapiro and Stiglitz, 1984). Moreover, higher wages might be perceived by the workers as a gift and therefore induce more effort to return the favor (Akerlof, 1982). Also, firms offering higher wages than their competitors might be able to choose from a greater pool of higher quality job applicants and those high potential workers are

more likely to quit if wages are cut (Weiss, 1980). Also, high-wage employers might pay above average wages because they decrease the turnover of employees and therefore they save costs of hiring and training new workers while their workforce acquires more company-specific human capital (Hashimoto and Yu, 1980). Furthermore, if employers pay wages below what workers perceive as fair, they reduce their efforts accordingly (Akerlof and Yellen, 1985). Apart from cutting wages, another way for companies to slash wage costs would be to dismiss current employees (insiders) and replace them with unemployed workers (outsiders) for a lower wage. However, companies might refrain from that because the remaining insiders might be unwilling to cooperate with their new colleagues which greatly weights on productivity (Lindbeck and Snower, 1989).

If prices and wages on the individual firm level change only infrequently, for reasons stated above, the aggregated price level should exhibit a significant degree of inertia as well as inflation persistence[31]. The reason that not only the price level exhibits inertia but also its rate of change, the inflation rate, is persistent is that growing economies usually exhibit a growing price level and, hence, a positive average inflation rate. Macroeconomic changes or shocks therefore should lead to a deviation from the growth path of the price level and, thus, to a deviation from the average inflation rate Dhyne et al. (2009).[32] Such a deviation allows countries to adapt over time to asymmetric shocks in a monetary union, i.e., restoring competitiveness via the real exchange rate and bringing aggregate demand and supply back to equilibrium levels. The faster and the stronger the inflation rate deviates, the faster the country returns to the full utilization of its capacities or, in case of positive shocks, end the over-utilization of their capacities.

4.6.2. Price responses to severe downturns

In order to empirically address the question of how fast and strong, if at all, countries' prices react to macroeconomic shocks, one can take a look at the drop of the inflation rate when an economy is hit by a negative shock. Negative shocks necessitate downward adjustments of the inflation rate or even absolute price reductions. To investigate if that is the case, the most severe downturns for all African countries between 1992 and 2012 are identified, measured as the strongest drop in the

[31] There are different definitions of inflation persistence in the literature. Batini and Nelson (2002) and Batini (2002) distinguish three kinds of inflation persistence: 1) positive serial correlation in inflation, 2) lags between systematic monetary policy actions and their (peak) effect on inflation, and 3) lagged responses of inflation to non-systematic policy actions (i.e., policy shocks). Willis (2003) defines it as the speed with which inflation returns to baseline after a shock. They all have in common that it describes some form of inertia of inflation rates.

[32] That does not exclude the rather seldom cases of zero or even negative average inflation rates.

output gap (as calculated in section 4.5.2). Then, it is checked whether the inflation rate drops as well in the same year. The relevant measure of inflation is the inflation of domestic production prices in contrast to the consumer prices which include prices of imported goods. Therefore, the inflation rate is measured as the annual rate of change of the deflator of total sales, if available, or otherwise the GDP deflator. The deflator of total sales is the preferred measure as the GDP deflator has the drawback that the import prices enter its calculation with a negative sign. This distorts the measure of domestic production prices (Dovern, Jannsen and Scheide, 2009). The deflator of total sales solves that problem by adding the imports which therefore drop out of the calculation.[33]

In order to make the contemporary inflation responses $\Delta\pi$ comparable between the countries which exhibit very different levels of average inflation $\bar{\pi}$ and different magnitudes of drops in their output gap *gap*, the following measure of the inflation response *IR* is calculated:

$$IR = \frac{\frac{\Delta\pi}{|\bar{\pi}|}}{\Delta gap}. \tag{4.8}$$

IR is positive when inflation decreases in the downturn year and positive when inflation recedes. Hence, a positive sign indicates a price response that allows countries to cope with asymmetric shocks as a drop in capacity utilization entails a drop in the inflation rate. The higher a positive *IR* is the stronger is the contemporary reaction of prices to shocks. *IR* could be interpreted as the change in inflation relative to average inflation per percentage point drop in the output gap.

The detailed results are listed in tables A.16 - A.19. Figure 4.10 summarizes the results by displaying the relative and absolute frequency of the *IR* values of the REC member states. The results are sobering. Despite the result that in 46 percent of the REC member states the inflation dropped in their most severe downturn year, in only 13 percent of the cases, the inflation response was economically meaningful, resulting in an *IR* above 0.1[34]. The remaining countries' inflation rates even increased; in some cases the surge was very pronounced. Moreover, there are considerable differences between the various RECs. While in ECCAS and ECOWAS about 70 percent of the member countries have a positive *IR*, none of the EAC and IGAD member states exhibits a helpful price reaction. For comparative reasons, the *IR* for the European Monetary Union, Germany, and the United States are calculated as well. All of them had their sharpest drop in capacity utilization

[33] The deflator of total sales DTS is calculated as the implicit price deflator of nominal GDP Y_n plus nominal imports Im_n divided by the real GDP Y_r plus real imports Im_r times 100: $DTS = 100 * \frac{Y_n + Im_n}{Y_r + Im_r}$.

[34] For example, if a country had an inflation rate of two percent prior to a downturn with a drop in the output gap of one percentage point, an *IR* of 0.1 would mean that the inflation rate dropped to 1.8 percent.

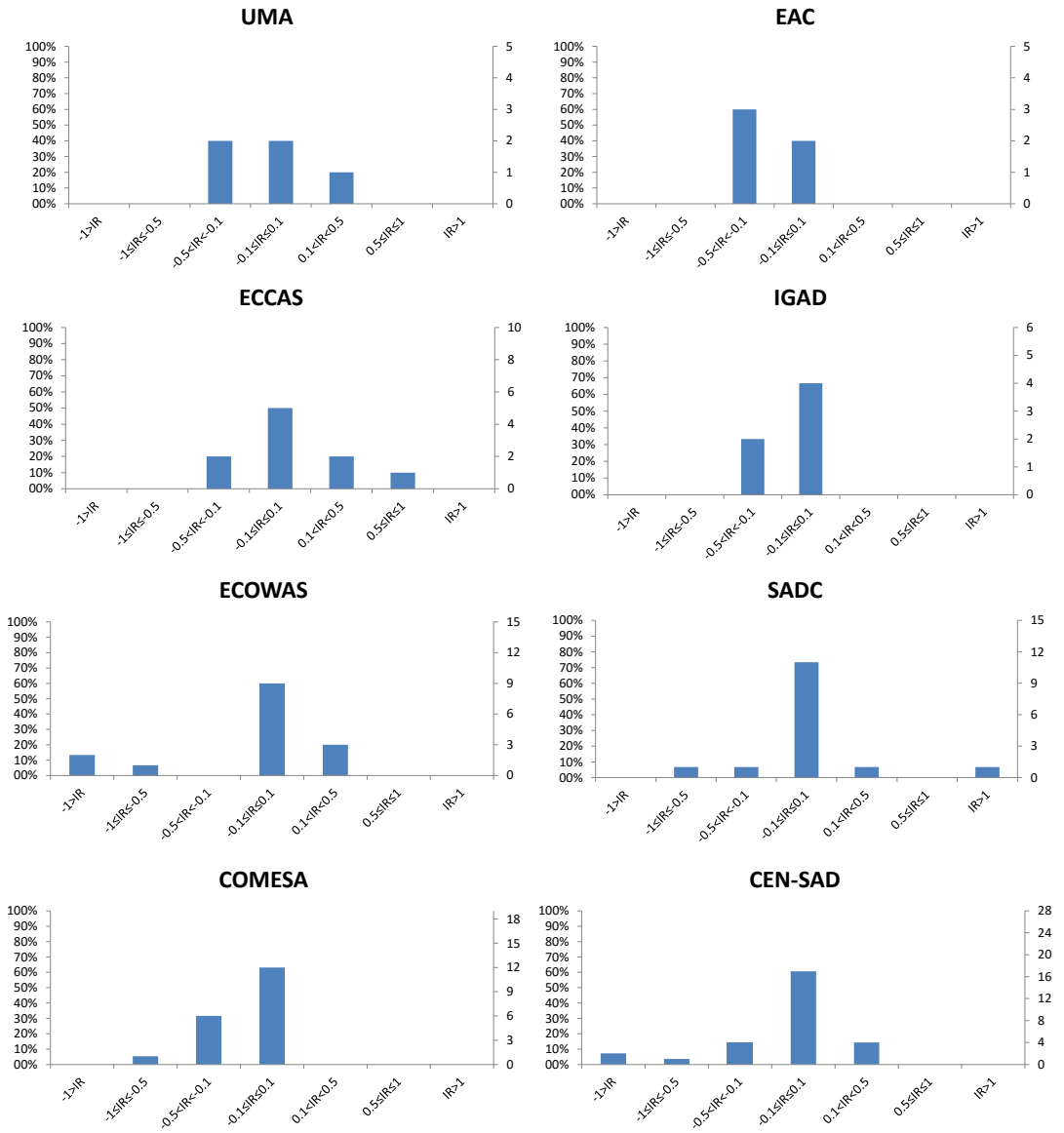

Figure 4.10.: Relative and absolute frequency of *IR* values in RECs

Note: Left scale: relative frequency in percent. Right scale: absolute frequency in number of countries. The right scale's length equals the number of investigated REC member states.
Source: World Bank, own figure and calculations.

in 2009 – the year of the so called Great Recession. All of them experienced a considerable fall in inflation. In particular, the Eurozone and the United States exhibit *IR* values that are higher than those exhibited by almost all African countries with a positive *IR* (except for Congo (Rep.) and Lesotho). These results indicates, that monetary union memberships would be very costly for African countries.

4.6.3. Evidence from Phillips Curve estimates

Looking at the reaction of inflation in the sharpest downturn of African countries only gives a snapshot in time as it looks only at one observation and does not mean that countries with negative or positive *IR* systematically react to shocks that way. Moreover, the change in the inflation rate is very likely influenced by other factors as well. Therefore, a broader approach is in order to determine whether or not African countries' inflation rates react timely and in a shock-absorbing direction to positive as well as to negative macroeconomic shocks.

The theoretical and empirical workhorse for describing inflation and its dynamics is the Phillips Curve in its various variants. In its original contribution, Phillips (1958) described the negative relationship between the growth rate of nominal wages and the unemployment rate. Later versions replaced the growth rate of wages with the inflation rate as both are highly correlated. Also, some later versions used the output gap as a measure of macroeconomic capacity utilization as a costs push inflation factor instead of the unemployment rate. Moreover, in response to the high inflation and high unemployment phase of the late 1970s and early 1980s, inflation expectations were integrated into Phillips Curve models. Rational expectations, i.e., expectations formed by economic agents in perfect knowledge of the functioning of the economy based on their current set of information, became the most frequently used way of modeling expectations in theoretical and empirical Phillips Curve models (King, 2008). However, rational expectations are often criticized for assuming unrealistically high economic expertise and are therefore a poor description of the way economic agents form expectations (Evans and Honkapohja, 2004). That critique is supported by several empirical studies which found no evidence for rational expectations (see for example Branch (2004)). In order to overcome the problems of using rational expectations, several authors turned to using real expectations instead. Carroll (2003) suggests the use of households' expectations as well as forecasts of professional forecasters instead of rational expectations. Fuhrer (2012) used survey data on households' inflation expectations to estimate inflation dynamics in the United States.

In order to investigate the behavior of African countries' inflation rates π in response to real macroeconomic shocks, measured by changes in the output gap, two types of the Phillips Curve are estimated. Inflation is measured as the annual rate of change of the deflator of total sales or the GDP deflator, depending on availability. The first (equation 4.9) is a version of the Phillips Curve

known as the Hybrid New Keynesian Phillips Curve (Hornstein, 2008):

$$\pi_t = \beta_0 + \beta_1 \pi_{t-1} + \beta_2 E[\pi_{t+1}] + \sum_{n=0}^{2} \beta_{3+n} gap_{t-n} + u_t. \tag{4.9}$$

It is called "hybrid" because it combines versions of the Phillips Curve with purely forward looking inflation expectations and purely backward-looking inflation expectations. For the forward looking expectations $E[\pi_{t+1}]$, data of actual forecasts for the following year's inflation rate of the IMF's World Economic Outlook[35] are used. The backward-looking expectations are captured by the autoregressive term π_{t-1}. As a measure of capacity utilization, and therefore the cost-push inflation, the output gap gap is used. In order to allow for some delay in the reaction of inflation to changes in capacity utilization, the first and second lag of the output gap are included as well. u_t denotes the nuisance parameter. The second version of the Phillips Curve estimated is a purely backward-looking model as it leaves out the forward-looking term of equation 4.9. There are several reasons for estimating this second, more restrictive version of the Phillips Curve. Firstly, the IMF inflation forecasts have only been done since 2002 which severely limit the number of observations available to estimate the hybrid model. Secondly, it is unknown whether or not the IMF forecasts are a good proxy for the real expectations of Africans, if they are forward-looking at all. And thirdly, the true model of how inflation expectations are formed in African countries is unknown which calls for model diversity. In particular, considering the likely lower degree of economic literacy in Africa as well as the lower dependability and predictability of monetary policy compared to many developed countries.

Both versions are estimated as single equations using the Ordinary Least Squares method. In the empirical literature it is often pointed out that using Ordinary Least Squares probably lead to biased and inconsistent estimators as the output gap is possibly not an exogenous variable. The reason is simply that there is an interdependence between inflation and the output gap (at least in the short-run) as an inflation shock could cause a change in the output gap and vice versa. Using instrumental variables, Two or Three Stage Least Squares, or the General Method of Moments offer potential solutions but require suitable instrumental variables. These methods bear the risk of choosing a weak instrument which might lead to an even larger bias (Nason and Smith (2008) and Hornstein (2008)). Moreover, all these methods only offer consistent estimators, i.e., they are

[35] The IMF's World Economic Outlook is published biannually usually in April and October. For this study, only the October forecasts are used as they are based on a set of information and indicators for the first half of the year, which best proxies the average set of information available to economic agents throughout the whole year to form their inflation expectations.

only nearly unbiased in large samples. Given the small sample sizes, in particular for the hybrid Phillips Curve estimations (only up to eleven observations), their estimators are biased as well. In addition, the Ordinary Least Squares estimators are more robust to mis-specification (Gaab, 2004, 141-142). Given the lack of knowledge of the exact processes that generate inflation in African countries, mis-specifications cannot be ruled out. For that reasons, the Ordinary Least Squares method is deployed in awareness of its potentially biased estimators. Another potential bias arises when estimating the purely backward looking Phillips Curves because they miss inflation expectations as a possibly relevant explaining variable. In order to assess the possible distortion of $\hat{\beta}_3$ caused by leaving out the forward-looking term, the Variance Inflation Factor (VIF)[36] is estimated for the backward-looking model of each country. Fortunately, the VIF seldom exceeds the critical value of five which indicates that the distortion is usually small.

As the true or best model for every country is unknown, the specifications of each country's Phillips Curves are done by a stepwise regression[37] algorithm.[38] This algorithm leaves out insignificant regressors and includes only regressors that are significant on at least a ten percent significance level using the heteroscedasticity and autocorrelation consistent standard errors of Newey and West (1987). After finishing that algorithm, the selected specification is tested for structural breaks[39] in the constant and slope parameters, for outliers[40], and for a deterministic

[36] The VIF is calculated as $VIF = \frac{1}{1-R^2}$. R^2 denotes the coefficient of determination of an auxiliary regression that regresses all other explaining variables of equation 4.9 on the forward-looking inflation expectations.

[37] Stepwise regression is a semi-automated tool used in building and selecting statistical models. It offers a way to handle the trade-off between parsimony (include only as many variables as necessary to reduce variance) and completeness (include all, even remotely, relevant, variables to maximize the fit) of a model. Moreover, it is helpful if (economic) theory only provides a general direction which explanatory variables might be of relevance. For instance, in case of the Phillips curve, economic theory does not provide the appropriate lag structure of the output gap variable since it depends on the degree of price and inflation persistence. Hence, the explanatory variables need to be chosen based on statistical criteria. Stepwise regression automates that decision process by including or excluding significant or insignificant variables at each regression step. Unfortunately, that approach has some limitations. The most severe is that in a forward selection approach, i.e., building up a model beginning with the most simple one and successively adding significant variables, the decision of including an additional variable is taken based on the results of an estimation of a potentially incomplete model, that might suffers from the omitted variable bias. In a backward selection process, i.e., shrinking a model starting with one that contains all possible regressors, suffers from the risk of falling victim to the Type I error, i.e., accidentally including an actually insignificant variable. Stepwise regression is also prone to multicollinearity because variables might get (not) accepted to the model because the are (in)significant because of multicollinearity.

[38] The model selection algorithm used here combines two approaches. In the forward selection approach, variables are added to the model sequentially until no variable not yet in the model would, when added, have a t-statistic with a p-value smaller than 0.1. In the backward selection approach, the starting point is from the full set of regressors. Variables with the lowest t-statistics are deleted until all remaining variables have a p-value smaller than 0.1. Both approaches are combined by running the forward selection procedure and then running the backward selection algorithm at each stage to delete variables which now have too small p-values (Estima (ed.), 2013).

[39] Levin and Piger (2009) shows that testing for and when found modeling structural breaks in the mean of inflation is essential to correctly measure inflation persistence. Structural breaks are identified using the Andrews-Ploberger-Test for structural breaks at unknown point(s) in time (Andrews and Ploberger, 1994).

[40] Outliers are detected using the measure of Krasker and Welsch (1982).

trend which (when found) are appropriately modeled using dummy variables and or deterministic trend series.

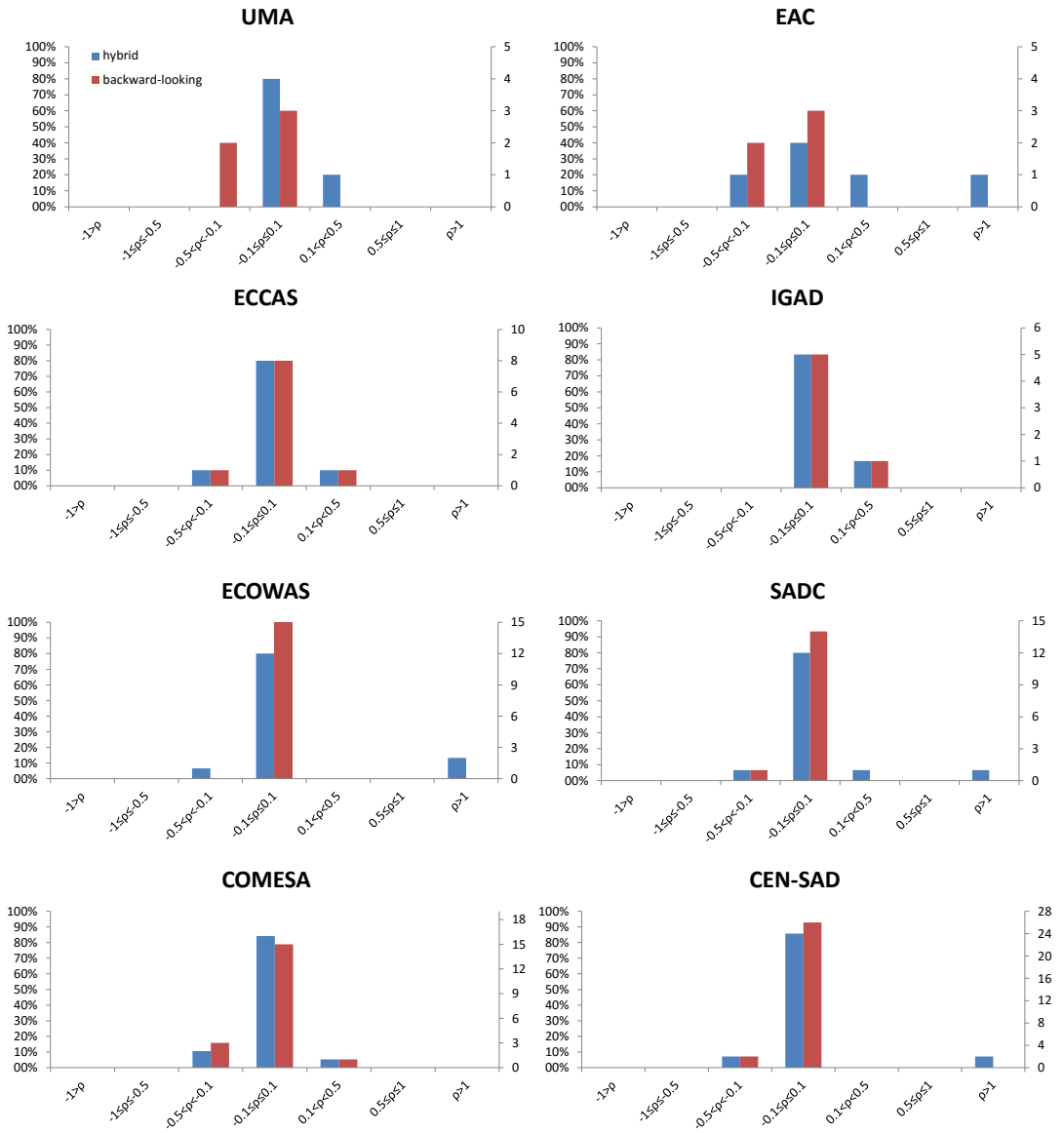

Figure 4.11.: Relative and absolute frequency of ρ values in RECs

Note: Left scale: relative frequency in percent. Right scale: absolute frequency in number of countries. The right scale's length equals the number of investigated REC member states.
Source: World Bank, own figure and calculations.

For the purpose of this study, the most interesting parameter is β_3 in both versions of the Phillips Curve. It measures the direction and size of the contemporary response of the inflation rate to changes of the macroeconomic capacity utilization. A highly positive β_3 indicates that the inflation

rate reacts in a way that helps to cope with macroeconomic shocks. For instance, a negative asymmetric shock would lead to a reduction of the inflation rate of that country which enables it to (re-)balance its real exchange rate. In order to calculate a comparable measure ρ of the inflation response of the different African countries with different levels of average inflation, the estimated β_3 parameters are divided by the average inflation $\bar{\pi}$ of that country in the sample period:

$$\rho = \frac{\hat{\beta}_3}{\bar{\pi}}. \tag{4.10}$$

The regression detailed results are listed in tables A.20 - A.23 in the appendix. Figure 4.11 displays the absolute and relative distribution of REC member states' contemporary inflation responses relative to their average inflation (ρ) of both types of Phillips Curves. The results confirm the conclusion drawn in the previous investigation of inflation responses to severe downturns. Regardless of the type of Phillips Curve, the values of ρ in all RECs are highly concentrated around zero, meaning that the vast majority of African countries' inflation rates exhibit no significant contemporary reaction to changes of the capacity utilization. Only in very few countries inflation adapts in a way that supports a timely coping with macroeconomic shocks.[41] However, it should be noted that the validity of the Phillips Curve estimations results seems rather limited as they usually are not capable to deliver a robust explanation of the processes that generate the usually high and volatile inflation rates of African economies.[42] Structural breaks and outliers are frequent and parameter values and signs are not always plausible. One possible reason is that, for the hybrid models, the number of observations is small. Moreover, the IMF forecasts might not be a good proxy variable for the actual inflation expectations of Africans. And if inflation expectations play a significant role, they are missing in the backward-looking model. Another possible explanation is the rather low degree of development of monetary policies and institutions in African countries which might lead to erratic and counter-productive policy measures. Central banks are usually not independent and are a mere department of the finance ministry. They usually do not aim at price stability and macroeconomic stability but rather provide public revenue via the printing press. Hence, there is hardly any systematic process generating inflation (data) that can be estimated or separated from the noise.

[41] Some countries even exhibit inflation reactions that exacerbate shocks, e.g., inflation rises after a negative shock to output. A possible explanation for these counter-productive reactions are pro-cyclical policy measures such as lifting price caps, cutting or withdrawing price subsidies or downward adjustments of a fixed exchange rate which raises prices of imported production inputs.

[42] For the purpose of validating the method deployed here, the hybrid and backward-looking Phillips Curves were also estimated for the EMU, Germany, and the United States (Table A.23). The hybrid model seems to work pretty well for the United States while for Germany and for the EMU the expectations seem to be purely forward looking. Moreover, all three countries' parameter estimates show the expected sign and exhibit plausible magnitudes.

4.6.4. Interim conclusion

The results of the analyses of severe downturns and the Phillips Curve estimations suggest that, given the little synchronicity of business cycles and high frequency of asymmetric shock in Africa, adjustments of the pace of the growth of prices and wages are not a channel to cope with them. This leaves only the movement of production factors as a way to absorb asymmetric shocks in the proposed regional monetary unions as well as the ultimate continental monetary union. However, the seemingly little responsiveness of prices and wages to shocks is not carved in stone. Improving the legal framework, institutions as well as the conduct of economic policy in the process of regional integration might lead to a higher responsiveness to shocks in the future as the responsiveness in the past measured in this study.

4.7. Labor mobility

Besides the reaction of prices and wages to shocks, the degree of mobility of production factors plays a crucial role in monetary unions as they enable member states to cope with asymmetric shocks, in particular long-lasting structural shocks, however, at often high social costs[43]. Since financial capital is expected to be very mobile in a monetary union, it can swiftly react and help to support shock adjustment. Real capital and, in particular labor, are usually much more immobile. Therefore, they can only be part of an adjustment to long-lasting, usually structural, shocks.

Labor mobility in Africa is currently legally restricted. Only ECOWAS has already implemented free movement of member state citizens (Table 2.1). However, legal restrictions need to be enforced to be binding. The large number and huge length of land borders makes them fairly permeable. Legal restrictions to labor mobility are therefore not very binding (World Bank (ed.), 2009, 152). To get a first indication on labor mobility, Table 4.2 shows RECs' migrant stocks in percent of population by region of origin. Migrant stocks are the results of past migration flows. Hence, high stocks of migrants are most likely associated with high degrees of labor mobility and vice versa.[44] The statistics demonstrate that in all RECs migrants account only for a small part

[43] For individuals, moving to another country often means leaving their family, friends, and property behind. Moreover, large-scale movement of labor leaves the emigration country deprived of its work force and often high qualified specialists (brain drain). In the immigration country, it potentially leads to increasing scarcity of affordable housing and increased competition with natives on the labor market. This potentially leads to social conflicts.

[44] Caveat: Migrant stocks possibly understate the degree of labor mobility because some migrants that immigrate as a

	Overall	from remaining REC	from remaining World	REC migrant quota
UMA	1.3	0.1	1.2	5.2
EAC	1.6	0.6	1.0	37.3
ECCAS	1.7	0.8	0.9	48.1
IGAD	1.3	0.3	1.0	22.6
ECOWAS	2.0	1.7	0.3	86.1
SADC	1.5	0.8	0.7	55.5
COMESA	1.2	0.4	0.8	34.0
CEN-SAD	1.7	1.2	0.6	66.1
EMU(12)	11.5	1.9	9.6	16.6

Table 4.2.: Weighted average of RECs' member countries' migrant stock as percent of total population

Note: Country averages weighted by population. The REC migrant quota is the percentage of migrants that immigrated from the remaining REC countries.
Source: United Nations: International migrant stocks by destination and origin (2013 revision). Own table and calculations.

of total population. In comparison to the EMU[45] where 11.5 percent of population are migrants, the African RECs' migrant stocks rage between just 1.2 and 2.0 percent of total population. However, looking only at migrants from the remaining REC countries, which is the relevant number for shock adjustment within the proposed monetary unions, the EMU and the African RECs are not that far apart any more. ECOWAS, where about 86 percent of migrants originate from within the REC fares best with 1.7 percent REC migrants compared to 1.9 percent in the EMU. All other RECs, however, perform substantially worse, in particular UMA where merely 0.1 percent of the population are REC migrants.

result of asymmetric shocks possibly repatriate or emigrate to other countries as a reaction to another asymmetric shock.

[45]The EMU aggregate here encompasses only twelve of its current 19 member states: Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, and Spain. All countries, except Greece which joined 2001, are founding members of the EMU. They all have a long history, for some dating back to 1958, of free movement for workers between their national labor markets.

Looking at migrant stock data points to the result that labor mobility is rather limited. However, flow data likely gives a better indication whether labor mobility contributed to adjustment after asymmetric shocks or helps to equalize cyclical differences. Tables A.24 - A.27 display net migration flows, calculated from the stock data provided by the United Nations, and the cyclical differences between REC member states and the remaining REC, calculated as the sum of yearly differences in output gaps in percent, for the periods 1990-2000 and 2000-2010. On average, in about half the cases (50 percent 1990-2000 and 55 percent 2000-2010) net migration flows contributed to an equalization of cyclical differences. Therefore, a simple look at the data does not give a clear indication whether or not African migration flows systematically contribute to bolster cyclical differences as the number of cases where migration exacerbated cyclical differences is nearly equally high.

$$\begin{aligned} |NetMigr_{it}| = \beta_0 + \beta_1|\Delta gap_{it}| + \beta_2(Pop_j \times Pop_k)_{it} + \beta_3|\Delta GDP_{it}| + \beta_4 Dist_{it} \\ + \beta_5|\Delta PolStab_{it}| + \beta_6 ComLang_{it} + \beta_7 ComBord_{it} + \beta_8 Island_{it} + u_{it}. \end{aligned} \tag{4.11}$$

To determine whether migration reacts systematically to macroeconomic shocks, a panel regression approach is deployed (equation 4.11, all variables in logarithms) using migration flow data of the 1990-2000 and 2000-2010 periods of 324 African country pairs that are in the same REC. The regression model is an augmented gravity model based on Lewer and Van den Berg (2008) that uses the product[46] of the country of origin's population Pop_k and the country of destination's population Pop_j as "gravitational mass"[47] and the linear distance between the geographical centers of the two countries $Dist_{it}$ in 1000 kilometers[48] as an indicator of migration costs. $|NetMigr_{it}|$ denotes the absolute net migration[49] from country j to country k in persons. The absolute difference in the output gaps $|\Delta gap_{it}|$ of both countries tests whether or not different stages of j and k in their business cycles affect the movements of people. The absolute difference in unemployment rates of both countries is used as an alternative indicator as well.[50] To control for other possible reasons

[46] That implies that both countries have the same coefficient or elasticity.

[47] The more people there are in a country of origin, the more people are likely to migrate, and the larger the population in the destination country, the larger is the labor market for immigrants.

[48] Linear distance data gathered from http://www.luftlinie.org.

[49] The net migration is calculated as the change in stocks of residents in country j (destination country) that originate from country k (country of origin) minus the change in stocks of residents in country k (destination country) that originate from country j (country of origin). This approach only takes into account the movements of nationals of these two countries. People of third country nationality that move between the two countries are not included. This drawback is owed to the lack of that data. The only available source of data is the data on international migrant stocks for the years 1990, 2000, and 2010 from the United Nations population division that is used here (United Nations (ed.), 2013).

[50] Since absolute values of the regressor and the regressand are used to be able to build a log-linear model, the coefficient

for movements of people, a set of control variables are incorporated in the regression model, i.e., the absolute difference in the political stability and absence of violence index $|\Delta PolStab_{it}|$, the absolute income difference between j and k measured by GDP per capita in international Dollars $|\Delta GDP_{it}|$, and dummy variables for a common language $ComLang_{it}$, common border $ComBord_{it}$, and if either j or k or both are an island $Island_{it}$. The subscript i represents the country pair and t the time period. The variable u_{it} denotes the error term and β_0 the constant term.

The regression results are displayed in Table 4.3. According to the SIC, the random effects model[51] with time specific effects is the superior model. The pooled model is rejected by the Breusch-Pagan test. The regression results demonstrate that the gravity model works fairly well in explaining bilateral net migration as the population mass is highly significant with a positive sign while the distance between countries is highly significant as well with a negative sign. Neighboring countries exhibit significantly higher migration flows as expected. The same applies to islands. This seems implausible at first but considering that it is controlled for distance and that people who need to move from or to islands need to use planes or ships, the positive coefficient tells us that distance for these people is a lesser barrier than for people moving on the continent. Income differences, difference in political stability, and a common (official) language do not contribute to explain migration flows. The, for the purpose of this study, important coefficients show the right (positive) sign either using the absolute difference in output gaps or in unemployment rates.[52] However, only the difference in output gaps is significant and the estimated elasticity is stable throughout different models. However, the coefficient is rather small as migration only increases by merely about 0.15 percent when the difference in output gaps widens by 1 percent. Considering that the average net migration of an African nation with its remaining REC for the entire ten year period of 2000-2010 over all RECs is about 103000 people, an increase of the output gap difference from one to two percent would, on average, only lead to an increase in net migration by 15500 people of a country with all its other REC partners. This is almost negligible compared to multi-million populations of the RECs. Nonetheless, labor movements seem to react in a helpful way to

of the absolute difference in output gaps or unemployment rates only shows whether or not the net migration increases in absolute terms but not in which direction people move. However, it seems highly unlikely that people systematically move to the country with the weaker economy or higher unemployment.

[51] Fixed effect models are not estimated as distance and the dummy variables are time invariant.

[52] The random effects model with country-pair specific effects using the difference in the unemployment rate as variable to measure the difference in business cycles exhibits surprising properties. In this model, the estimated coefficients of all variables, which are very robust throughout the other model specifications, changed significantly and became insignificant while the coefficient of determination (R^2) improved considerably and the SIC deteriorated noticeably. That is most likely the result of severe multicollinearity between the country-pair specific effects and the difference in unemployment rate variable.

long-term or structural asymmetric shocks. Making free movement of people a fundamental right within the RECs, and later the AEC, might lead to a significantly higher contribution of migration to the mitigation of asymmetric shocks.

	Panel Model 1 (pooled OLS)		**Panel Model 2 (random effects)** *Time-specific effects*		**Panel Model 3 (random effects)** *Country-pair-specific effects*		**Panel Model 4 (random effects)** *Country-pair- and time-specific effects*	
Constant	-4.891*** (3,27)	-4.898*** (3,24)	-4.919*** (3,29)	-5.053*** (3,35)	-4.891*** (3,27)	-0,874 (0,16)	-5.151*** (3,43)	-5.221*** (3,45)
Δ Output gap	0.150** (2,40)		0.149** (2,39)		0.150** (2,40)		0.141** (2,27)	
Δ Unemployment rate		0,066 (0,92)		0,065 (0,92)		0,116 (0,74)		0,065 (0,91)
Population mass	4.683*** (8,34)	4.585*** (8,07)	4.692*** (8,36)	4.637*** (8,17)	4.683*** (8,34)	1,040 (0,62)	4.763*** (8,46)	4.692*** (8,24)
Δ Income	0,046 (0,76)	0,039 (0,63)	0,047 (0,77)	0,044 (0,71)	0,046 (0,76)	-0.137* (1,73)	0,054 (0,89)	0,049 (0,79)
Distance	-1.591*** (8,35)	-1.600*** (8,33)	-1.593*** (8,36)	-1.611*** (8,37)	-1.591*** (8,35)	7,241 (1,28)	-1.609*** (8,37)	-1.623*** (8,39)
Δ Political Stability Index	0,074 (1,02)	0,089 (1,22)	0,074 (1,01)	0,087 (1,20)	0,074 (1,02)	-0,075 (1,19)	0,072 (0,99)	0,085 (1,18)
Common language	-0,053 (0,28)	-0,096 (0,51)	-0,052 (0,28)	-0,092 (0,49)	-0,053 (0,28)	-0,144 (0,63)	-0,048 (0,26)	-0,088 (0,47)
Island	1.874*** (4,88)	1.830*** (4,73)	1.877*** (4,89)	1.845*** (4,78)	1.874*** (4,88)	-1,660 (0,93)	1.894*** (4,94)	1.861*** (4,83)
Common border	2.201*** (9,10)	2.210*** (9,03)	2.199*** (9,09)	2.201*** (8,98)	2.201*** (9,10)	9.759** (2,03)	2.185*** (8,99)	2.19*** (8,92)
Observations	648	648	648	648	648	648	648	648
Degrees of freedom	639	639	639	639	639	639	639	639
R^2	0,416	0,412	0,416	0,413	0,416	0,905	0,417	0,414
SIC	4,541	4,548	4,541	4,548	5,503	11,099	5,516	5,483
Breusch-Pagan (p-value)	0.00***	0.00***	-	-	-	-	-	-

Table 4.3.: Regression results: Migration and cyclical differences

Note: Figures in parentheses are heteroscedasticity-consistent t-statistics. *** indicates significance at the 99% level, ** at the 95% level, and * at the 90% level.
Source: World Bank, United Nations, Luftlinie.org, own table and calculations.

4.8. Multiple memberships

As explained in chapter 2, many African countries are members in more than one single REC. This is a great obstacle to regional integration. Moreover, the countries with multiple memberships ultimately need to decide which regional monetary union they want to join. While the membership in several free trade areas is possible and even desirable, the membership in more than one monetary union seems absurd. It would make sense for these countries to join the monetary union which is most beneficial to them or, based on the results of the empirical analyses done in this chapter, rather the least costly. This section therefore uses the empirical results obtained above to make a proposal on how the problem of multiple memberships can be resolved.

The decision on which monetary union a country should join is based on only two criteria. The first criterion is the amount of trade in percent of GDP (Table A.1) which is an indicator for the benefits of the monetary union.[53] The second criterion is the degree of business cycle synchronization measured by the correlation of output gaps after 1994 (tables A.10 - A.13) as an indicator for the costs incurred by a monetary union. As the responses of prices as well as migration flows to asymmetric shocks play no significant role in any REC, they are not incorporated in the decision. Moreover, the correlation coefficients are only included in the decision if they are significant on at least a 10 percent level. In many cases, the correlation coefficients are not statistically different from zero. The decision is then solely based on the trade criterion. If the correlation is significant and both criteria collide and the differences are considerable, e.g., the trade criterion suggests another monetary union as the synchronicity criterion, the decision is based on the regional integration progress made so far by the RECs (Table 2.1).

The comparison of both criteria is listed in tables A.28 - A.30. Based on this comparison, a new partition of African countries into just five monetary unions seems advisable (Figure 4.12). ECOWAS, which currently is a 100 percent subset of CEN-SAD, would entirely be merged into CEN-SAD. The same applies to UMA, where currently only Algeria is not a member of CEN-SAD, which it should join after the dissolution of UMA.[54] The analysis also renders that

[53] The trade criterion naturally favors bigger units, in particular, if they have a significant overlap or if one (almost) subsumes the other, as it is the case for ECOWAS and CEN-SAD as well as IGAD and COMESA. That disregards the problem that bigger units might find it harder to negotiate supranational agreements.

[54] As the political conflict between Morocco and Algeria regarding the Western Sahara conflict is one of the major obstacles to the progress of UMA, it might be advisable to leave Algeria out of CEN-SAD. Otherwise it might be advisable to exclude Morocco from CEN-SAD as it has already quit its AU membership because of the AU recognition of Western Sahara as an independent state which Morocco claims to be an integral part of its territory.

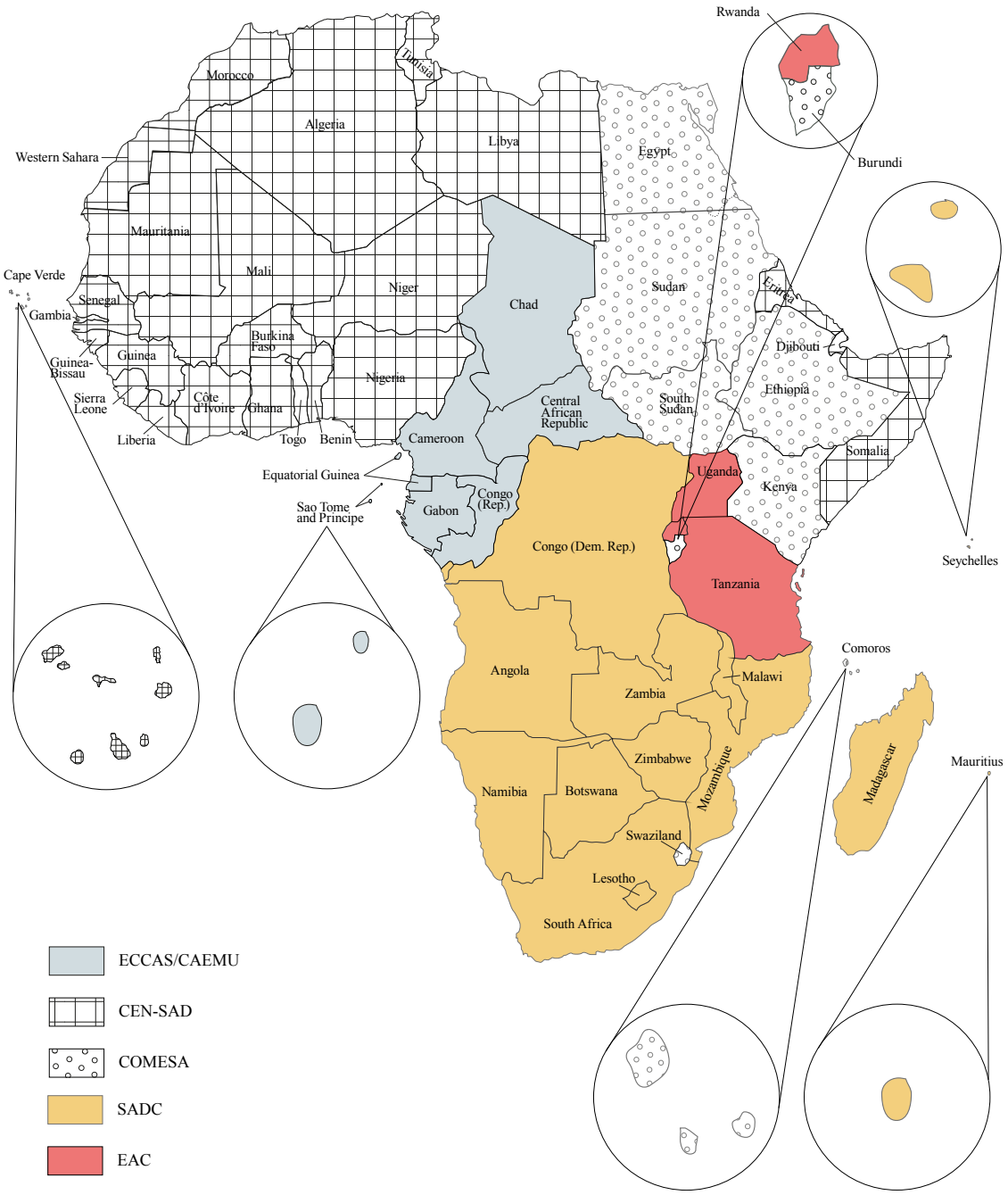

Figure 4.12.: Reorganized Regional Economic Communities.

Note: Western Sahara is not a sovereign state and most of its territory is occupied by Morocco and de facto belongs to CEN-SAD. Island countries (Cape Verde, Comoros, Mauritius, Sao Tome and Principe, and Seychelles) only displayed by their major islands.
Source: Own figure, map template by d-maps.com (ed.).

it would make sense to abolish IGAD. All its members are better off (or indifferent) pursuing monetary union membership in one of the other RECs they are already members of. The abolishing of IGAD also makes the negotiation of the envisaged tripartite free trade area encompassing

COMESA, EAC, and SADC easier as it erases one group of interest. In addition, the results suggest that the EAC should be continued without Kenya and Burundi which continue their affiliation with COMESA. Moreover, there is another interesting result: ECCAS would lose Angola and the Democratic Republic of Congo to SADC leaving member states of the Central African CFA franc zone CAEMU, which makes ECCAS obsolete as well. This result matches quite well with the five RECs originally foreseen by the Abuja treaty.

The analysis conducted above has some drawbacks, as it is based on the current multiple memberships in the RECs. Every change of membership of an REC would actually necessitate a recalculation of the trade and synchronicity criteria which would result in an iterative process. This might lead to a different distribution of the proposed REC memberships.[55] Moreover, it was not considered that it might be more beneficial to some countries to join another REC which they are not members of.[56] Apart from that, the analysis was solely based on criteria drawn from the theory of optimum currency areas. Other considerations, such as political feasibility, are disregarded. Nonetheless, it provides a decision aid for the high number of countries that are faced with the decision which monetary union they should ultimately join if they are determined to do so.

[55] Hence, the criteria are only valid if only one member state changes its membership.

[56] When one would from scratch, it is possible to calculate a matrix with all possible combinations of member states for a given number of RECs to determine the best possible distribution of memberships.

5. Central Findings and Comparisons

In chapter 4, the following research questions were asked and successively answered.

1. How high are intra-African and intra-REC trade?
2. How diversified is African trade?
3. How synchronized are the business cycles of African countries or how common are asymmetric shocks?
4. Is business cycle synchronicity endogenous?
5. How flexible are prices and wages?
6. Do migration flows mitigate asymmetric shocks?
7. Which regional monetary union is the most suitable one for countries with multiple REC memberships?

This chapter summarizes the findings unearthed in the previous chapter and compares them with the results of other studies, if there are any at all. It also highlights the particular contribution of this study to the literature. As a general contribution, to the knowledge of the author, this study is the only comprehensive empirical study that assess the African Unions monetary integration plans on regional and continental level. Other studies are merely concentrating on certain regions or partial aspects of the planned monetary unions and in many cases on the three already existing monetary unions.

5.1. Intra-African and intra-REC trade is too low

Trade is one of the key variables determining the benefits and costs of monetary unions. The more the (future) monetary union members trade with each other, the higher are the benefits in terms of saved transaction costs and the elimination of the exchange rate risk. Moreover, the more

they trade with each other, the more likely are their business cycles aligned and the less likely are asymmetric shocks. Hence, the costs of monetary union membership – in terms of lost output – decrease with rising trade.

The data presented in section 4.4 clearly demonstrate that, with the exception of Zimbabwe, every single African country mostly trades with non-African countries. Intra-African and intra-REC trade is comparatively low, even though there are considerable differences between the various RECs. The fairly low trade integration of the RECs and Africa as a whole means that the benefits from a common currency are rather limited while the costs are potentially high. Moreover, African exports are not very diversified. On the contrary, African countries' exports are usually specialized on very few raw materials and unprocessed agricultural products. This makes sector-specific shocks that assume macroeconomic proportions more likely.

In economic literature there are a number of earlier studies bemoaning the low degree of intra-African trade. For instance, the latest Economic Report on Africa, issued by the UNECA, finds that intra-African trade (2011 data) accounts for merely 13 percent of Africa's overall exports. Other regions of the world fare much better. In particular, Europe fares better, where 70.6 percent of the trade is intra-European trade, followed by Asia with 52.8 percent and North America with 48.3 percent. Only the primarily oil-exporting Middle East fares even worse than Africa with 8.8 percent (United Nations Economic Commission for Africa (ed.), 2015). Bayoumi and Ostry (1997) investigate the intra-African, intra-CFA, and intra-ECOWAS trade flows between 1981 and 1993. Comparing their results with the calculations of trade shares by the United Nations Economic Commission for Africa (ed.) (2015, 152-154) demonstrates that internal trade shares have only improved little since then as intra-African trade amounted to 11.7 percent in the 1970 to 1993 period compared to 13 percent in 2011. Bayoumi and Ostry (1997) also recognize the problem of a potentially large amount of informal trade flows across Africa's highly permeable borders that are not covered by the official data which Foroutan and Pritchett (1993) estimate to about equally high as official trade. Hence, the potential benefits of a monetary union are gravely underestimated by merely looking at official trade data. However, even taking Foroutan's and Pritchett's estimates of informal trade into account, Bayoumi and Ostry still deem intra-African trade insufficient for outweighing the costs of a monetary union. This conclusion is shared by the overwhelming majority of studies for Africa as a whole (see for example Belhadj, Bangake and Jedlane (2007) and Nnanna (2006)) and for particular RECs (see for example Benassy-Quere and

Coupet (2005), Foroutan and Pritchett (2011), Khamfula and Huizinga (2004), Loureiro, Martins and Ribeiro (2011), Nnanna (2006), Masson (2008), Masson and Patillo (2001), Ogunkola (2005), Tsangarides and Qureshi (2008)).

Cham (2007) poses a rare exception in the existing literature. He finds that trade in relation to economic output (openness) in ECOWAS and its sub-RECs WAMZ, and WAEMU is sufficient to meet the criteria of the optimum currency area theory. He concludes that national monetary policies in Africa are probably ineffective as a stabilization tool because prices are to a considerable degree determined on a regional and international level rather than domestically. His conclusion is based on the comparison of the overall openness of ECOWAS' member states with that of European countries. He finds that they do not differ much. However, he only measures overall openness with all trading partners and does not differentiate between intra-REC trade and trade with third countries. In the opinion of the author, this is a serious error. Moreover, a high degree of openness does not necessarily mean that monetary policy is ineffective as stated by Cham (2007). On the contrary, an alteration of the exchange rate is much more felt in an economy that imports and exports much than in a rather closed economy independent of the fact that the market prices of import and export goods are determined on an international market (see also De Grauwe (2012, 50-52)).

Longo and Sekkat (2006) empirically investigate the major obstacles which prevent higher intra-African trade using an expanded gravity model. Beside the obvious reason that trade is impeded by tariffs, they identify insufficient infrastructures, poor economic policies, and internal political tensions as additional hurdles to increased internal trade.

5.2. African economies are vulnerable to sector-specific shocks

Beside the magnitude of trade, its composition is also of vital interest for the assessment of the costs of a monetary union. For the costs to remain low it is advantageous that the exports of the member states are diversified. The evaluation of the IMF's data on export diversification in section 4.4.2 indicates that the exports of African economies are highly concentrated. African countries are usually specialized in exporting raw materials and unprocessed agricultural products, unfortunately not necessarily the same ones. That raises the likelihood that a country is hit by a sector-specific shock while the other members of the proposed monetary unions are not,

leaving that country deprived of the possibility to conduct an anti-cyclical monetary policy and to devaluate its currency. Taking Nigeria as an example, according to the Observatory of Economic Complexity (ed.) data, its exports (2013 data) consist to 90 percent of crude petroleum and petroleum gas, i.e., Nigeria is very vulnerable to changes in the oil price. The Observatory of Economic Complexity (ed.) data also show that none of its fellow ECOWAS members is even nearly as depended on oil and gas as Nigeria. Ghana's, ECOWAS' second largest economy, major export goods are Gold (30 percent) and cocoa beans (27 percent), followed by crude petroleum with only 19 percent. The situation in UMA is similar. While Algeria and Libya are major oil and gas exporters, Mauritania's exports consist to over 70 percent of iron ore, copper ore, and gold.

The problem of the generally low diversification of African countries' exports is well documented in the literature (see for instance Nnanna (2006), Kaptouom (2007), and Songwe and Winkler (2012)). The UNECA's regularly published reports "Assessing Regional Integration in Africa" routinely call attention to the problem of Africa's little diversified production and trade (see for example United Nations Economic Commission for Africa (ed.) (2006) and United Nations Economic Commission for Africa (ed.) (2012a)). Nnanna (2006) also points out that the few goods African countries are specialized in, are usually not complementary. Thus, there is hardly any common component in a sector-specific shock that would make it less asymmetric for member states. The reasons for the low diversification are manifold and, of course, there are comparative advantages involved. However, comparative advantages are not the only explanation. According to Page (2008), some countries fell victim to the resource curse and in particular the so called "Dutch disease"[1] while others were unable to emancipate themselves from the resource extracting and monocultural farming their former colonial masters established. A joint study of the United Nations and the Organisation for Economic Co-operation and Development identified further impediments to diversification of African countries' sectors and exports: intra-African as well as international trade barriers, the lack of access of private companies to finance, weak productive capacities (in particular the lack of a well-trained labor force), and administrative hurdles (United Nations and Organisation for Economic Co-operation and Development (ed.), 2010).

However, there are arguments for countries with poorly diversified exports to join a monetary

[1] The term "Dutch disease" coined by the Economist in 1977 and describes the phenomenon that the large revenue generated from large scale resource exports causes an increase of the real exchange rate. The high value of the currency decreases the competitiveness of other domestic sectors which therefore shrink. This makes the country even more dependent on exporting its resources (The Economist (ed.), 2014).

union because it can act as a risk-sharing and insurance mechanism (Mundell (1973) and McKinnon (2004)). Therefore, it would be advantageous for countries that are highly specialized on few but different goods to join a monetary union if it involves a transfer system that bolsters sector-specific asymmetric shocks. However, against the backdrop of the European sovereign-debt crisis, which revealed the limited degree of supranational solidarity in Europe, such a risk-sharing and transfer system in African RECs with much weaker institutions seems rather unlikely to work in the foreseeable future. Moreover, such a risk-sharing and transfer mechanism could be implemented independent of a monetary union.

5.3. Business cycles of African countries are not synchronized

Business cycle synchronicity or the absence of asymmetric shocks is one of the central criteria of the theory of optimum currency areas. For prospective monetary union member states, giving up their sovereign right of issuing their own national currency and pursuing an independent monetary policy comes at high costs if their business cycles are not well aligned. Monetary policy can no longer act as a stabilizer by conducting anti-cyclical policy measures and adjustments of the nominal exchange rate between the member states are also no longer possible. This study deployed two approaches to investigate how synchronized business cycles are between African REC member states and an aggregate of the remaining REC members. Firstly, a correlation analysis of GDP growth and inflation rates was conducted. Secondly, the correlation of output gaps, calculated using the Hodrick-Prescott Filter, was examined. Both approaches point to the result that, in general, the business cycles of the prospective monetary union member states are not sufficiently synchronized, i.e., asymmetric shocks seem to be common. Even though some RECs perform better on synchronicity than others, none of them reach correlation coefficients that indicate well aligned economies. However, they seem to have become a little more synchronized since the advent of the AEC in 1994.

Given its importance, there is a large body of literature on business cycle synchronicity in the EMU but also in Africa. Unfortunately, not all RECs are covered and the variety of different empirical approaches makes it difficult to compare their results. Hence, to the knowledge of the author, this is the first study that calculated a uniform and therefore comparable metric for business cycle synchronicity for all of Africa's prospective regional monetary unions. Adams (2005) differentiates between four empirical approaches that are common in the literature:

5. Central Findings and Comparisons

- "Shocking" studies;
- Correlation and cluster analyses;
- Generalized-purchasing power parity studies;
- Optimum currency area indexes;

The so called "shocking" studies make use of various versions of Structural Vector Autoregression (SVAR) models, first introduced by Blanchard and Quah (1989). They often encompass a system of at least two equations modeling output growth, inflation, and other macroeconomic variables of an economy (see for example Bayoumi and Eichengreen (1994)). These models are estimated for every (prospective) member state and then used to identify structural parameters[2] as well as demand and supply shocks. The correlation of these shocks is then used as an indicator of business cycle synchronicity. Moreover, this approach allows to asses how similar the countries respond, in terms of magnitude and speed, after being hit by an external shock in impulse response analyses[3]. The approach pursued in this study fits into the second category – the correlation and cluster analyses. Compared to the first approach, it is a rather simple but robust[4] technique. It allows to asses the synchronicity of shocks as well as their magnitudes, measured as the size of the output gap. Unfortunately, it is not able to capture and compare shock responses of countries. However, given that joining a monetary union means a (monetary policy) regime change that very likely changes the way economies adapt to shocks, the results of impulse response analyses based on models estimated on pre-unification data are of limited inferential value. Therefore, in the opinion of the author, the first approach does not justify the considerably higher effort. The second approach also offers the possibility to extend correlation analyses to more than one criterion and combine them in a cluster analysis to identify country groups with high similarities. For instance, Artis and Zhang (2001) use six criteria for their cluster analysis of EMU member states: correlation in business cycles, real exchange rate volatility, real interest rate correlation, openness to trade, inflation differential, and labor market flexibility. Such a cluster analysis goes beyond the scope of this study. The aim of this study is to empirically evaluate the actually planned regional

[2] The models are usually estimated as reduced form equation systems, i.e., all endogenous variables depend only on exogenous variables and residuals. The structural parameters need to be retrieved, in case of over-identified equation systems by applying theoretical restrictions (identification problem).

[3] In an impulse response analysis, the equation system is used to simulate how strong and fast it responds to a standardized, external shock (impulse) to its residuals.

[4] If controlled for structural breaks, the Hodrick-Prescott Filter delivers very good ex-post estimates of business cycles, in particular if time series are extended using forecasts generated by simple autoregressive models to mitigate the boundary value problem (see section 4.5.2).

monetary unions in Africa, not hypothetical ones a cluster analysis would render. The third approach uses a cointegration analysis to determine whether (prospective) monetary union members' real exchange rates share a common trend (called generalized purchasing-power parity), usually with a dominating anchor country, and how strong that common trend is compared to other exchange rate movements. This method was developed by Enders and Hurn (1994). The idea is that exchange rates react to economic shocks. Hence, if real exchange rates move mainly synchronous, asymmetric shocks are seldom or prices react quickly and vice versa. However, for that approach to deliver a reliable measure of business cycle synchronicity, nominal exchange rates need to be fully flexible. In Africa, about a third of the countries are already members of one of Africa's three existing monetary unions, two of them (the CFA zones) with a fixed exchange rate to the Euro. A number of the other African countries have some form of exchange rate restrictions, such as fixed exchange rates, pegs, and currency boards (see International Monetary Fund (ed.) (2014a)) for details). The fourth approach, the calculation of an optimum currency area index, was introduced by Bayoumi and Eichengreen (1997). The idea of that index is to measure the feasibility and desirability of a monetary union by the degree of nominal exchange rate volatility of its future members. The more volatile their exchange rates are, the more common are asymmetric shocks and the more they need a flexible exchange rate to cope with the shocks and, hence, the more costly would a monetary union be. Technically, they ran a regression analysis that explains the standard deviation of a country's nominal exchange rate against the Deutsche Mark by the standard deviation of GDP growth rate differences (variable that measures business cycle synchronicity), the bilateral trade volume in percent of both countries' GDP (measures monetary union benefits), both countries' average GDP (measures economic size), and the difference in the shares of agricultural, mineral, and manufacturing trade in total merchandise trade (another measure for the asymmetry of shocks on the grounds that industry-specific shocks will be more symmetric when two countries have a revealed comparative advantage in the same export sectors). Hence, the approach of Bayoumi and Eichengreen (1997) goes beyond merely measuring the similarity of business cycles as their approach incorporates also the benefits of monetary union. They then use the regression model to make in-sample and out-of-sample forecasts for the exchange rate volatility for different time periods which are the values of the index. The index values are then used to assess how similar the countries are in a given time period as well as to assess whether countries converge or diverge. However, in the opinion of the author, their index only presents a correct measure if the regression is estimated on data of a time period when exchange rates moved freely. That was neither the case in Europe prior to the Euro's introduction (the European Exchange Rate Mechanism limited

exchange rate movements to fluctuate within agreed boundaries) nor is it the case in many African countries as explained above.

There is a number of studies deploying some form of the four approaches explained above for some African countries and regions to assess business cycle synchronicity. The most interesting ones are the correlation analyses (see Table 5.1) that allow not only qualitative but also quantitative comparisons with the results of this study. The United Nations Economic Commission for Africa (ed.) (2012b) and Drummond et al. (2015) examine the degree of business cycle synchronicity of EAC member states. Drummond et al. (2015) calculate the correlation coefficients of GDP growth rates of EAC member states with each other as well as with an aggregate of the remaining countries for the 1990-2013 period. The United Nations Economic Commission for Africa (ed.) (2012b) study calculates bilateral correlation coefficients of output gaps, obtained using the Hodrick-Prescott Filter, for the 1990-2009 period. Drummond et al. (2015) find low and even negative correlation coefficients in similar magnitudes as found in this study (see Table A.6). Moreover, they find that the correlation improved somewhat over time by comparing the correlations of pre- and post-1999 sub-samples, a result that was also found in this study for the pre-1994 and post-1994 period. The United Nations Economic Commission for Africa (ed.) (2012b) study, however, finds considerably higher and only positive correlation coefficients than in this study. For the 1990 to 2009 period, the average of their bilateral correlation coefficients is 0.59 and even 0.72 for the 2001 to 2009 sub-period, i.e., they suggest a high degree of business cycle synchronicity. In comparison, this study yielded average correlation coefficients of EAC member states of -0.04 for the pre-1994 and 0.35 for the post-1994 period (see Table A.10). This difference is possibly due to the different observation periods and the fact that the United Nations Economic Commission for Africa (ed.) (2012b) study calculated bilateral correlation coefficients while this study calculated the correlation between a country's output gap and that of an aggregate of the other EAC member states. In the opinion of the author, the latter is the more relevant measure as it better quantifies how often a common monetary policy is challenged to weigh the macroeconomic needs of a member country being hit by an asymmetric shock against that of the remaining member states. Nonetheless, the great and qualitatively important difference between the results still surprises. Harris et al. (2007) calculate the bilateral correlation coefficients of the deviations of real GDP per capital from its long-run trend of CMA member states (1980-2003 data) as a measure of business cycle synchronicity. They find mostly negative correlation coefficients between -0.46 and 0.09. Hence, their results indicate that shocks to the CMA member countries are for the most

part asymmetric. Bayoumi and Ostry (1997) investigate the correlation of GDP growth within the CFA zones, ECOWAS, and SADC using data from the University of Pennsylvania World Tables (Version 5.5) spanning from 1963 to 1989. Their GDP growth correlations are very low on average and close to those found in this study for the pre-1994 period (see Table A.6 and Table A.14). Cham (2007) assesses the co-movement of GDP in the planned monetary union WAMZ and the existing monetary union WAEMU. He finds correlation coefficients that are, on average, positive but close to zero, i.e., 0.05 and 0.06, respectively. Thus, his results indicate that business cycles are not aligned in both areas which is in accordance with the results of this study.

Beside these studies on regional level, there are two studies that investigate continental business cycle synchronicity: Karras (2006) for 37 African countries and Tapsoba (2010) for 53 African countries. Karras (2006) calculates the correlation coefficients of every country with an Africa aggregate for GDP growth rates and two output gap measures, one calculated using the Baxter-King Filter and one using the Hodrick-Prescott Filter, using data for the 1960 to 2000 time period. Regardless of the measurement technique, the calculated correlation coefficients are low with an average of about 0.15. This confirms the findings of this study. Tapsoba (2010) arrives at a somewhat smaller correlation coefficient for all 53 African countries for the 1965 to 2004 period of about 0.04. He compares this number with the average correlation coefficient of CFA monetary union member states which is barely higher with a value of 0.07. Also, both correlation coefficients are not statistically significantly different from zero. He also computed the correlation coefficients for the Organisation for Economic Co-operation and Development (OECD) (0.4) and EMU member states (0.56) which are disproportionately higher, reflecting their high degree of economic integration. The results of Tapsoba (2010) for the EMU are confirmed by (Frenkel and Nickel, 2005) who deployed an approach similar to this study for eleven EMU countries[5] using quarterly GDP and inflation (GDP deflator) data from 1993-2001. They calculated the correlation coefficients for each member state with the EMU aggregate.[6] Their results indicate a high synchronization of the EMU member countries in the run-up and introduction phase of the Euro. Except for Portugal and Greece, which have correlation coefficients statistically not different from zero, all other member states exhibit a statistically significant correlation coefficient of their GDP growth rates with that of the EMU aggregate over or close to 0.6. Hence, from the perspective

[5] Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Portugal, and Spain.

[6] The method of Frenkel and Nickel (2005) has the drawback of neglecting that the EMU aggregate already contains the member state itself. That leads to an upward distortion of the correlation coefficient, in particular for large countries.

of the similarity of shocks, the EMU countries were far better prepared for monetary union at the time of its introduction than African economies are currently.

The results (see Table 5.1) of studies using some of the other approaches, which are introduced above, overwhelmingly support the central finding of this and other studies that use correlation analysis, i.e., that business cycles in Africa and its regions are not synchronous. ”Shocking” studies are done for the EAC by Buigut and Valev (2005) and Kishor and Ssozi (2009), for ECOWAS by Chuku (2012) and Houssa (2008), for WAMZ by Harvey and Chushing (2015), for SADC by Buigut and Valev (2006), and Khamfula and Huizinga (2004), for the CFA zones by Fielding and Shields (2000), and Zhao and Kim (2009), and for UMA by Abdallah and Bouchaddakh (2009). Cointegration and generalized-purchasing power parity studies are done by Buigut (2011), the United Nations Economic Commission for Africa (ed.) (2012b), and Mkenda (2001) for the EAC. While Buigut (2011) and United Nations Economic Commission for Africa (ed.) (2012b) find no cointegration in the EAC countries' real exchange rate and, hence, no evidence for business cycle synchronicity, Mkenda (2001) finds cointegration for the 1981 to 1998 period. Adams (2005) calculated an optimum currency area index for Africa using data from 1981 to 2003. He finds that, in comparison to the results of Bayoumi and Eichengreen (1997) done for the EMU countries prior to the Euro's introduction, Africa performs poorly. However, Africa's performance improved over time.

All in all, this study contributed to the, so far rather patchwork, literature by conducting the first correlation analyses of GDP growth, inflation, and output gaps for all African RECs. That allows assessing the AU's regional integration strategy as a whole and makes comparisons between the regions and their progress possible. The results of this study's analyses are overwhelmingly in line with the results of prior research which generally concludes that synchronization of business cycles is insufficient. That result can be regarded as robust since it is shared by very different empirical approaches.

Approach	Author	Region(s)	Results
"Shocking" study	Abdallah and Bouchaddakh (2009)	UMA	Shocks are generally asymmetric
	Buigut and Valev (2005)	EAC	Shocks are generally asymmetric but shock responses are similar
	Buigut and Valev (2006)	SADC	Shocks are generally asymmetric
	Chuku (2012)	ECOWAS	Shocks and shock responses are generally asymmetric
	Fielding and Shields (2000)	WAEMU, CAEMU	Shocks are generally asymmetric but regrouping would improve situation
	Harvey and Chushing (2015)	WAMZ	Shocks and shock responses are generally asymmetric
	Houssa (2008)	ECOWAS	Shocks are generally asymmetric
	Khamfula and Huizinga (2004)	SADC	Shocks are generally asymmetric
	Kishor and Ssozi (2009)	EAC	Shocks are generally asymmetric but improvement since 1999
	Zhao and Kim (2009)	WAEMU, CAEMU	Shocks are generally asymmetric
Correlation analysis	Bayoumi and Ostry (1997)	WAEMU, CAEMU, ECOWAS, SADC	Low and negative correlation: business cycles not sufficiently synchronized
	Cham (2007)	WAMZ, WAEMU	Low but mostly positive correlation: business cycles not sufficiently synchronized
	Drummond et al. (2015)	EAC	Low and negative correlation: business cycles not sufficiently synchronized
	Harris et al. (2007)	CMA	Low and negative correlation: business cycles not sufficiently synchronized
	Karras (2006)	37 African countries	Low but mostly positive correlation: business cycles not sufficiently synchronized
	Tapsoba (2010)	53 African countries	Low correlation: business cycles not sufficiently synchronized
	UNECA (ed.) (2012b)	EAC	High and positive correlation: business cycles fairly synchronized
Generalized-purchasing power parity study	Buigut (2011)	EAC	No cointegration: business cycles not synchronized
	Mkenda (2001)	EAC	Cointegration: business cycles synchronized
	UNECA (ed.) (2012b)	EAC	No cointegration: business cycles not synchronized
Optimum currency area index	Adams (2005)	Africa	Poor performance of African countries in comparison to pre-EMU European countries

Table 5.1.: Overview of literature on business cycle synchronicity in Africa

Source: Own table.

5.4. African inflation rates seldom adapt timely after shocks

If prices were fully flexible, asymmetric shocks would not pose a problem to monetary unions. They would adapt instantaneously to re-equilibrate member state's real exchange rates and economies as a whole. However, in reality there are a number of reasons why prices are not fully flexible (see section 4.6.1). Hence, the more inflexible prices are, the more costly is a monetary union for its member states.

Owing to its importance for the costs of monetary unions, there is a vast body of literature on price setting behavior and inflation persistence[7] in the Euro Area and its member states. Many studies use high-frequency (usually monthly) dis-aggregated data, such as sub-indexes of price indexes, sectoral, and even company level data, to measure how frequent and to which extent prices change (see for example Angeloni, Aucremanne and Ciccarelli (2006), Dhyne et al. (2009), Fabiani et al. (2005), and Le Bihan and Matheron (2011)). Other studies use quarterly producer and consumer price index data to determine the degree of inflation persistence (see for example Angeloni, Aucremanne and Ciccarelli (2006), Dhyne et al. (2009), and Marques (2004)). Altissimo, Ehrmann and Smets (2006) give a detailed overview and summary of the research done on price flexibility and inflation persistence in the Euro Area by the Inflation Persistence Network, a research group of the Euro Area's central banks. Their empirical evidence suggests that the degree of inflation persistence in the EMU is moderate but that prices in the Euro Area are stickier than in the United States. In addition, there is significant heterogeneity regarding the degree of price flexibility between sectors.

A major problem for determining the degree of price rigidity in African Economies is the lack of high-frequency microeconomic data with a sufficiently long data history, which would allow the measurement of the frequency and magnitude of price changes, with the notable exception of South Africa. Only a few other African countries commenced on publishing monthly dis-aggregated sub-indexes of their consumer price indexes in recent years. To the knowledge of the author, sectoral or even individual company level data is completely unavailable. Thus, that leaves

[7] Inflation persistence is the dynamic pendant to the static concept of price rigidity. In growing economies with continuously rising price levels it is sufficient that the rate of change of prices, i.e., inflation, adapts to macroeconomic shocks to, over time, re-equilibrate member state's real exchange rates and economies as a whole. Imagine a monetary union consisting of two member states at full utilization of their capacities (output gaps equal zero), their inflation rate is on target, and their real exchange rate is at its equilibrium level. If an asymmetric shock occurs, where one country gets hit by a negative shock leading to a negative output gap while the other country remains unaffected. If the affected country's inflation rate decreases while the other country's inflation remains on target, the real exchange rate would return to its equilibrium value over time.

only low frequency (annual) macroeconomic price index data for analyses. This study uses these data and deploys two approaches to measure the price or rather inflation reactions in African countries. In the first approach, the inflation reaction to the severest downturn of a country's economy, defined as the most severe drop of the output gap, are analyzed. In the second approach, two types of Phillips Curves, one with hybrid and one with backward-looking inflation expectations, were estimated for every African country. Both approaches also address a shortcoming of many studies done for Europe and other regions. They often merely measure the frequency and magnitude of price changes or the degree of inflation persistence and, hence, measure only the necessary condition that prices and inflation adjust timely after asymmetric shocks. However, they often stop short of investigating whether prices or inflation actually react to shocks or did so in the past. While the estimation of various versions of the Phillips curve is very common in the literature, the first approach, to the knowledge of the author, is, despite its simplicity, novel. Moreover, normalizing the reaction coefficients by dividing them by the average inflation rate to make them comparable was not found in the literature. The empirical results of both approaches suggest that inflation in African countries seldom reacts timely and in a helpful direction to macroeconomic shocks, measured as changes in the output gap. Given the low degree of business cycles synchronization, monetary unions in Africa would be very costly. However, it needs to be noted that the performance of the estimated Phillips Curves in explaining African inflation rates is rather poor. In a number of cases, they produced implausible coefficient estimates (unexpected signs) and almost always required the modeling of structural breaks and outliers. In contrast, the Phillips Curves estimated for comparative purposes for the EMU, Germany, and the United States perform comparatively well. They usually exhibit the expected positive reaction of inflation to changes in the output gap, which is in line with the findings in the literature. Taking, for example, the estimated equation for the EMU Smets (2003) estimated a coefficient of 0.18 in a hybrid Phillips Curve model using annual data from 1977-1997 compared to 0.12 estimated in this study using annual data ranging from 1996 to 2014.

There is a number of studies that made use of the aggregated, low frequency data for African countries as well. Du Plessis and Burger (2006) estimate several New Keynesian Phillips Curves for South Africa using Non-linear Generalized Methods of Moments[8] and assuming forward-looking rational expectations. They find significantly positive coefficients for the output gap[9] in

[8] As instrumental variables they use five lags of inflation, and two lags each of the log employment share, unit labor costs, de-trended output, and the long-short bond yield spread.

[9] Du Plessis and Burger (2006) use the deviation of the labor income share from its long-run average as a measure of

their Hybrid Phillips Curve estimates, however, considerably smaller than in this study. This might be the result of different samples as they use data ranging from 1975 to 2003 compared to data from 2002 to 2012 in this study. Moreover, they find evidence that some of their estimated models suffer from weak-instrument problems, i.e., the parameters are biased. They also find that their estimated models are not robust across different sub-samples which is in line with the structural breaks (break in constant in 2003), outliers (1980, 1981, 2003, and 2009), and negative deterministic trend found in this study. Nell (2006) also finds instabilities in his South African Philips Curve estimates as well as a deterministic dis-inflationary trend between 1986 and 2001. He also finds that the relationship between inflation and the output gap is positive but not linear. It is rather piece-wise linear with a usually steeper slope for positive (upswing/boom) than for negative (downturn/recession) output gaps or changes in the output gap. In any case, his coefficient estimates for the output gap are smaller than in this study's hybrid model, which is possibly the result of different samples as Nell's sample ends in 2001. Maana, Maturo and Kisinguh (2006) estimate a hybrid New Keynesian Phillips Curve for Kenya with different specifications. They assume rational forward looking expectations and they use the Generalized Methods of Moments to estimate their models based on monthly data ranging from 1997 to 2005. In all their specifications they estimated significantly positive coefficients for the output gap between 0.2 and 0.4, i.e., Kenyan inflation reacts fairly strongly and timely to changes in capacity utilization. The hybrid Phillips Curve estimated in this study, however, could not find a significant effect. Here, as well, might the different sample periods play a role. They overlap only for the 2002 to 2005 period. Moreover, Maana, Maturo and Kisinguh (2006) use consumer price data instead of the, in the opinion of the author, more relevant domestic producer price data such as the GDP or total sales deflator. Consumer price data are likely to be distorted by exchange-rate movements as they contain prices of imported goods. Barnichon and Peiris (2008) estimate a hybrid Phillips Curve for a panel consisting of 19 sub-Saharan African countries[10] and annual data ranging from 1960 to 2003. They use consumer price data and control for country heterogeneity by including the difference in rainfall, in capital stock, and a war index. Country-specific intercepts ensure that different average inflation levels are accounted for. They find that the output gap plays an important role in sub-Saharan inflation dynamics with significantly positive coefficients in six out of eight specifications ranging between 0.23 and 0.33. However, they did not include the output gap as a contemporary variable which is the more relevant variable for timely adjustments after a shock but

the output gap.

[10] Botswana, Cameroon, Côte d'Ivoire, Ethiopia, Ghana, Kenya, Madagascar, Malawi, Mali, Mozambique, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, Swaziland, Uganda, Zambia, and Zimbabwe.

only as a one year lagged variable, i.e., they tested only for inflation responses to changes in capacity utilization one year after the changes occurred. This study's approach left the lag structure of zero up to three lags open to be selected based on statistical significance. Some of the countries included in the panel of Barnichon and Peiris (2008) exhibit similar coefficients for the first lag, i.e., Kenya (0.25), Mali (0.37), Niger (0.21), and Sierra Leone (0.36). On average, however, the coefficients of the 19 countries of the panel of Barnichon and Peiris (2008) estimated in this study are close to zero.

All in all, the results of this study regarding the responsiveness of inflation to changes in capacity utilization (real shocks) are partly in line with the literature. Some studies measure higher responsiveness for some countries or regions while others measure less. Possible explanations for the differences are different sample periods and different measures of inflation (consumer vs. domestic producer prices). Also, in the literature, there are often assumed rational forward-looking expectations while this study uses actual forecasts as a proxy for actual inflation expectations. In addition, this study deploys simple Ordinary Least Squares to estimate the Phillips Curves while the most other studies deploy the Generalized Methods of Moments. Both methods are prone to biased estimates as the output gap is likely an endogenous variable. Moreover, most of the literature confirms the result of this study that estimated Phillips Curves for Africa are unstable and suffer from structural breaks. Hence, empirical evidence on inflation responsiveness in Africa is mixed and of rather limited reliability. Regardless of that, it should be noted that all studies naturally measure inflation responsiveness in the past and it does not need to stay that way once African monetary unions are formed. Arpaia et al. (2015) find that real wages in EMU countries became more responsive to asymmetric shocks after the Euro's introduction. Altissimo, Ehrmann and Smets (2006) emphasize that price rigidity and the way companies set prices possibly depend on the monetary regime. They find evidence that after the introduction of the Euro price rigidity in the Euro Area countries decreased. This result is in accordance with the results of Matsaseng (2008). He finds that the price flexibility within the CMA is high while it is low in the other SADC countries with independent monetary policies. Moreover, Rangasamy (2009), using univariate autoregressive regression models to explain South Africa's inflation rates[11], finds that South Africa's inflation persistence declined considerably after an inflation targeting strategy was adopted by South Africa's central bank.[12] Angeloni, Aucremanne and Ciccarelli (2006), however,

[11] The sum of the autoregressive coefficients serves as a measure of inflation persistence. The closer it is to one, the more persistent is inflation as it, to a large part, depends only on its history or lagged values.

[12] In the Phillips Curve estimate of this study there was found, and modeled, a significant break in South Africa's

find no evidence that the price setting behavior and inflation dynamics in six EMU member states have changed significantly after the Euro's introduction.

5.5. Migration flows react to shocks but are too small to fully compensate asymmetric shocks

As argued above, African business cycles are not well aligned and their economies often suffer from asymmetric shocks. Moreover, prices and wages usually do not react timely to cushion these asymmetric shocks. There is another mechanism to offset asymmetric shocks, namely labor mobility. Ideally, idle workers move freely and quickly from one country suffering from unemployment to another where labor is scarce.

To the knowledge of the author, this study is the first that investigates whether migration flows in Africa systematically react to cyclical differences while controlling for other migration factors such as population mass, distance, income differences, and differences in political stability. The statistical model was estimated using a newly created panel data set that includes almost all African countries' migration flows to their fellow REC partner countries. The estimation results show that migration flows indeed increase when cyclical differences widen. Hence, migration does contribute to adjust after asymmetric shocks. But the contribution is negligible. Moreover, owing to the low frequency of migration data, the effect was estimated based on net migration flows in a ten year time period. Therefore, one cannot determine whether or not migration flows react swiftly to shocks. The reasons for the low amount of migration in Africa are manifold. Beside language barriers, xenophobia, and ethnic reservations[13], one of the major reasons for the limited migration in Africa stated in the literature are legal restrictions to labor mobility (see for example Adepoju (2001), Cham (2007), Nnanna (2006), and the United Nations Economic Commission for Africa (ed.) (2012a)). The RECs are, however, in the process of establishing full labor mobility rights (see Table 2.1). So far, only ECOWAS and its sub-REC WAEMU were able to achieve that. If the freedom of movement, residence, and establishment is fully implemented in all RECs, that would certainly give a boost to internal labor migration flows. Thus, looking at the past and current migration numbers likely understates the migration that will occur once the integration

average inflation in 2003. However, there is no significant break in the autoregressive parameter which would support the findings of Rangasamy (2009) of declined inflation persistence.

[13] One of the most striking examples of xenophobia in Africa and the lack of a common African or at least regional identity is the violence in South Africa against migrants from its northern neighbors (Valji, 2003). The same is true for the recent rekindling of the longstanding conflict between Tutsi and Hutu in East Africa.

on labor markets is concluded. Adepoju (2001) points out that there are considerable numbers of undocumented migrants that are probably not fully included in the official statistics used in this study which further understates the contribution of migration to shock adjustments.

As there are no studies on African migration in response to economic shocks there are some for other geographical regions. Monras (2015) finds anti-cyclical internal migration flows within the United States and Arpaia et al. (2015) find that migration flows within the European Union react significantly to differences in the unemployment rate with coefficient estimates similar to those of this study (see Table 4.3). Moreover, Arpaia et al. (2015) find that migration in the European Union absorbs about a quarter of an asymmetric shock within a year and half of the shock within five years. Jauer et al. (2014) also calculate a shock absorption rate of up to 25 percent within a year studying asymmetric labor market shocks in the Euro Area. However, they find that the major share of that migration comes from non-Euro Area countries, i.e., the EMU's internal labor mobility is rather limited. Dao, Furceri and Loungani (2014) and Beyer and Smets (2015) find even higher absorption rates for the United States, 54 and 43 percent, respectively. In addition, Arpaia et al. (2015) find that labor mobility in European countries significantly increased after joining the European Union's common market and that migration movements in response to shocks have doubled since the introduction of the Euro. This gives hope for a similar effect in Africa's RECs. However, they do not explain whether the European monetary unification made more movements necessary, because of the lack of national monetary policies to cope with asymmetric shocks or because labor mobility increased as an endogenous effect.

5.6. African monetary unions are not sufficiently endogenous to make monetary union worthwhile anytime soon

Throughout this study it was emphasized that the current degree to which African countries and regions fulfill the criteria of optimum currency areas cannot be seen as fixed and possibly improves endogenously through monetary union membership itself. Hence, countries that do not fulfill the criteria ex ante might do so ex post. One of the channels that might foster business-cycle synchronicity is increased trade (trade channel). As transaction costs decline by using a common currency, trade is likely to increase[14]. This, in turn, increases the interdependence of the mone-

[14] Rose and Stanley (2005) run meta-regression analyses of 34 studies on the effect of monetary union membership on trade. Their results show that, on average, bilateral trade increases by 30 up to 90 percent trough a common currency. Fielding and Shields (2005) find effects of similar magnitude in a study using data from 1981 to 2000 for

tary union members' economies. Another channel might be that national monetary policies are no longer a source of asymmetric shocks themselves. Monetary union might also lead to increased policy coordination between the member states, in particular, as it limits the scope for national fiscal policies that might be sources of asymmetric shocks as well (policy channel).

This study applied a panel regression approach that investigates both channels. It made use of the long time "natural experiments" of the three existing African monetary unions, whose member states act as the treatment group, while the monetarily independent African countries assume the role of the control group. Technically, bilateral correlation coefficients of REC member states' output gaps were regressed on a set of variables, including bilateral trade in percent of GDP to test for the trade channel and two other variables that test for an additional monetary union effect on synchronicity of business cycles[15]. The regression results (Table 4.1) indicate that both channels have significantly positive effects on business cycle synchronicity. While the effect brought about by the trade channel is strong, the effect of the policy channel is very small. On average, an increase in the countries' correlation coefficient of 0.1 takes about 150 years of common monetary union membership.

Frankel and Rose (1998) were among the first to empirically investigate the trade effect using data for 20 industrialized countries for a 20 year period. They regress bilateral correlation coefficients of a number of variables of economic activity, e.g., real GDP, employment, unemployment, industrial production, and output gaps on bilateral trade in percent of GDP (openness) or percent of total trade as well as a set of control variables. Their estimated coefficients for openness range from 0.03 to 0.077 which coincide quite well with the estimated coefficients of this study which range from 0.06 to 0.078.[16] They also tested for an additional effect of countries whose exchange rates are fixed by using a dummy variable. Their estimates demonstrate that the effect is usually not significant and unstable across the different measures of economic activity. That result is also in coherence with the results of this study that found no significant effect of monetary union membership on business cycle synchronicity when using a dummy variable. By contrast, Bayoumi and Eichengreen (1997), investigating the process of European integration, find a symbiotic relation-

19 African countries, including the CFA countries as treatment group. However, the effect declined over time.

[15] One variable is a dummy variable that assumes the value of one if both countries belong to the same monetary union. The other variable is the number of years both countries are in the same monetary union.

[16] The results also provide evidence against the view that increased trade might lead to more specialization and regional concentration that leads to less synchronized business cycles owing to more pronounced effects of sector-specific shocks (see for example Krugman (1993). At least, that effect seems to be dominated by the effects of increased trade integration that lead to more synchronicity.

ship between economic and monetary integration.

To the knowledge of the author, this study is the first one that investigated both the trade and the policy channel for African REC member states' business cycle synchronicity within RECs using an entirely new data set. Moreover, it is the only study that investigated the policy channel using not only a dummy variable but also the number of years in monetary union as a test variable. However, there is a number of prior studies on some African regions that investigated the trade effect deploying the technique developed by Frankel and Rose (1998). Belhadj, Bangake and Jedlane (2007) find no evidence for a positive effect of trade on business cycle synchronicity in UMA using data for the 1980 to 2003 time period. Eggoh and Belhadj (2015), however, find a positive trade effect for UMA with coefficient estimates ranging from 0.04 to 0.09 which is in line with the results of Frankel and Rose (1998) and the results of this study. Tapsoba (2010) uses a very rich data set encompassing 53 African countries with data from 1965 - 2004. He, deploying the approach of Frankel and Rose (1998), finds a significantly positive trade effect but no additional effect of monetary union beyond the trade effect using a dummy. Buigut and Valev (2005) confirm the results of the studies that use the Frankel and Rose (1998) approach. They find, using a SVAR approach for the EAC member states, that countries with higher trade integration generally exhibit a higher similarity of the shocks. Carmignani (2009) compares the degree of business cycle synchronization between CAEMU countries over four overlapping time periods (1960-1980, 1970-1990, 1980-2000, 1987-2007). He interprets the result that synchronicity has only marginally increased over time as an indication that there are little endogenous effects in that monetary union. That result is in line with the result of this study that business cycle synchronicity beyond the trade effect develops only very slowly over time. Masson (2008) points out that, even if the trade effect is as high as that of Frankel and Rose (1998), owing to the low level of intra-African and intra-REC trade, the effect is still insufficient to justify monetary union in retrospect. Tapsoba (2010) makes the point that official trade data used for the estimations likely understates the trade effect, but even when taking (estimates of) that into account, it is still insufficient for African monetary union to be self-validating.

5.7. Regional integration blocks need to be reorganized

The problem of overlapping memberships is often stated in the literature as one of the major reasons for the slow progress of regional integration and regularly missed timetables (see for example

the United Nations Economic Commission for Africa (ed.) (2006), the United Nations Economic Commission for Africa (ed.) (2012a), and the United Nations Economic Commission for Africa (ed.) (2013)). Doubling of efforts, conflicting regulations, and different rules of origin hamper in particular the establishment and functioning of free trade areas and customs unions. Moreover, countries with multiple REC membership ultimately need to decide which regional monetary union they want to join. In order to address this problem, COMESA, EAC, and SADC launched an initiative with the goal to form a free trade area that encompasses all of their member states.

Even thought the problem is often stated there are only but a few attempts in the literature to systematically address it. For instance, the UNECA dedicates an entire issue of its regularly published reports "Assessing Regional Integration in Africa" to the problem of multiple memberships in which criteria for a rational reorganization are derived. Yet it stops short of delivering a concrete proposal how REC should be reorganized. Instead, it merely outlays five different scenarios of reorganized RECs based on different criteria without deciding which is the most sensible and explicitly leaving it to politics to decide (United Nations Economic Commission for Africa (ed.), 2006).

Buigut (2006) uses different cluster analysis techniques not only to resolve the overlapping memberships of COMESA, EAC, and SADC member states but even allowing for a complete regrouping.[17] In his cluster analysis he uses a set of variables that indicate real and nominal convergence, including correlations of supply and demand shocks with major trading partners (the European Union and South Africa), trade volumes, public finances, and the inflation rate. He considers three scenarios, one without an anchor currency, one with the South African Rand as anchor currency, and one with the Euro as anchor currency. The scenario without an anchor currency seems the most appropriate one as there are no plans to use an anchor currency in the future monetary unions. Also, this scenario can be compared to the results of this study. Buigut's analysis yields that the entire region is not suitable as a single monetary union. Instead, he finds that the optimum number of currency unions is four, i.e., it should be added one. In particular, the EAC countries Kenya, Uganda, Rwanda, and Tanzania should form a monetary union joined by the current SADC-only member Lesotho. Moreover, Burundi, Malawi, and Zambia should build an own

[17] The possibility that another REC as the one(s) a country is already part of might be more suitable is not explored in this study. This study's purpose is to evaluate the actual monetary integration plans of the AU. Moreover, a complete reorganization of RECs is considered to be hardly politically feasible and would slow down the process of integration even further. Therefore, it seems more rational merely assigning the countries with multiple memberships to the most suitable REC, i.e., the least costly one, they are already part of.

currency block as well as Comoros, Ethiopia, Madagascar, Mozambique, and Sudan; except for Mozambique currently all COMESA members. The last suggested currency block encompasses Botswana, Egypt, Mauritius, Namibia, the Seychelles, South Africa, and Swaziland; except for Egypt currently all SADC members. The results are partially in line with the results of this study. In particular, the group around South Africa (except for Egypt) is also suggested in this study. Also, both studies conclude that the EAC should be kept even though in a slightly different composition. The differences in the results are mainly rooted in the fact that Buigut (2006) allows the possibility of entirely new compositions of currency unions while this study is limited to solving the problem of overlapping memberships.

Tsangarides and Qureshi (2008) perform similar cluster analyses using similar variables as Buigut (2006) in an attempt to find optimal monetary union arrangements in ECOWAS, its existing and planned monetary sub-unions WAEMU and WAMZ as well as CAEMU. They also do not limit their cluster algorithms to merely sorting out multiple memberships. Moreover, they do not take the membership of all ECOWAS members in CEN-SAD into account. They find considerable dissimilarities in the economic characteristics of the examined countries. In particular, ECOWAS's largest member states Nigeria and Ghana appear to be economic singletons and are therefore better of as monetarily independent nations. Hence, the results cast serious doubt on the sensibility of the planned establishment of WAMZ, letting alone its ultimate merger with WAEMU to create an ECOWAS wide monetary union. On the contrary, by taking the CAEMU countries into analysis as well, they find that the prospected WAMZ member states even better match with the CAEMU countries.

The approaches of Tsangarides and Qureshi (2008) as well as Buigut (2006) went beyond the question of resolving overlapping memberships as they searched for optimal clustering of countries in some parts of Africa regardless of the current REC membership situation. Moreover, even though both studies used seven variables to find appropriate clusters, they failed to include one of the key conditions of the theory of optimum currency areas: the synchronicity of member states' business cycles. Instead, they used the synchronicity of countries' business cycles with a common trading partner (South Africa and the European Union) as an indicator, even thought the theory of optimum currency areas demands synchronicity within the union, not with a third country. This study is the only one, to the knowledge of the author, that proposes a concrete solution to the multiple membership problems of all RECs based on empirically operationalized concepts of the theory

of optimum currency areas. This study's proposal includes the abolition of ECOWAS, IGAD, and UMA reducing the number of regional monetary unions to five. Moreover, ECCAS would shrink to a size that it encompasses only CAEMU countries which also solves the problem of a sub-REC. The detailed reorganization proposal is depicted in Figure 4.12.

Foroutan and Pritchett (2011) and Masson and Patillo (2004) propose another way to implement regional monetary unions that avoids the problem of multiple REC memberships. They propose to use the existing monetary unions, i.e., the two CFA zones (CAEMU and WAEMU) and the CMA as a starting point, and successively expand them based on compliance with convergence criteria (Masson and Patillo, 2004) and mutual advantageousness (Foroutan and Pritchett, 2011). Ultimately, that process would lead to a continental monetary union as well. However, their proposals pose the question of France's future role. France currently acts as anchor of stability in the two CFA zones as it guarantees their fixed exchange rate and convertibility to the Euro. It is hardly conceivable that France is willing to extend that guarantee to a growing number of member states and that these new members would even accept France's involvement in their monetary affairs.

5.8. Other factors not contemplated in this study

This study is purely limited to economic considerations provided by the theory of optimum currency areas. Whether or not African monetary union(s) are beneficial to the potential member states might also depend on a number of other economic and non-economic factors that need to be considered. This section gives a short overview of such factors discussed in the literature.

One idea is that the process of monetary integration and deliberate macroeconomic convergence might add incentives and momentum to deeper economic and political integration, harmonization, and economic reform which bears fruit beyond the advantages directly linked to monetary union. That is not a novel idea as it was already part of the discussion prior to monetary unification in Europe (see for example the European Commission (ed.) (1990)). Guillaume and Stasavage (2000) see monetary unification as a way to overcome the lack of credibility from which many national central banks in Africa suffer because they are not politically independent. A supranational central bank would naturally be more independent of single national governments. If African monetary unions were successful in creating supranational central banks, that credibly commit to price stability, this would help bringing inflation rates and inflation volatility down and increase financial

stability.[18] Masson and Patillo (2003) discuss the possibility that a monetary union lead to more sound fiscal policies during the process of macroeconomic convergence to fulfill convergence criteria. Also, after the creation of a monetary union, as already discussed in section 3.2.3, monetary union membership limits the scope for budget deficits and public debt as it is denominated in a currency of which the government has no immediate control of. However, the prospect of a bail-out by other monetary union members in case of over-indebtedness might even lead to more fiscal profligacy. Page (2003) discusses whether monetary union might not only help to bring monetary and fiscal policy in order but African countries' weak institutions and poor policy performance in general, e.g., civil conflicts, corruption, kleptocracy, absence of rule of law, poor infrastructure, and low investment. The channels through which monetary union might translate into generally better policy performance are supranational institutions that monitor and, if necessary, correct national policies.

The results of a comparative study between member states of the two CFA monetary unions and other African countries by Devarajan and de Melo (1987) seem to support the view. CFA member states in general outperformed their monetarily independent African peers in terms of fiscal soundness, price stability, and economic growth between 1960 and 1982. However, the CFA monetary unions have another and likely decisive feature that explains their relative success, their fixed exchange rate to the French franc, and, since 1999, to the Euro which is guaranteed by France.[19] That guarantee is an anchor of stability. Moreover, France has a say in the CFA's monetary policy decisions. Dissolving the CFA zones in favor of an ECOWAS and ECCAS monetary union would certainly mean the loss of that stability anchor. France will hardly be willing to guarantee the exchange rates of the new and considerably enlarged currencies unions, in particular, as they include, by African standards, the economic heavy weights Angola and Nigeria – former British and Portuguese colonies.

All in all, the success of monetary union as a driver for improved policies and development depends on whether the RECs are able to create credible and strong supranational institutions and

[18] Foroutan and Pritchett (2011) develop and calibrate a model in which they weigh the benefits from more credible monetary policy against the costs of originating from asymmetric shocks. They find that for most countries the costs outweigh the benefits but for some countries monetary union would be beneficial. However, their approach implicitly assumes that monetary union is the only way for the countries to successfully create a credible central bank committed to price stability. There might be ways of national reforms that achieve the same while avoiding the costs of a monetary union.

[19] Loureiro, Martins and Ribeiro (2011) calculate the correlation of output gaps of both CFA zones WAEMU, CAEMU with those of the EMU and show that they are not well aligned. Hence, the fixed exchange rate, which severely limits the scope for anti-cyclical monetary policy, possibly comes at high costs for the countries of the CFA zones.

rules. However, it is hard to consider how a set of weak national institutions will be able to create strong supranational ones. In order to overcome that problem and to profit from its macroeconomic stability, Cobham and Robson (1994) propose to peg Africa's new common currencies to the Euro as stability anchor. The goal is to emulate the success of the CFA zones as well as that of other European countries that imported credibility from Germany via the Exchange Rate Mechanism of the European Monetary System prior to the Euro's introduction.

6. Conclusions and Policy Implications

Based on the empirical findings unearthed in this study, there can only be one conclusion: Africa and its RECs are not ready for regional monetary unions let alone continental monetary union. The benefits are limited as intra-REC and intra-African trade is low. It is by far surpassed by trade with the remaining world. Moreover, costs are probably fairly high given the low degree of business cycle synchronization and the high frequency of asymmetric shocks which are not bolstered by swift reactions of prices and migration flows.

It is more important for African leaders to focus on improving peace, political stability, economic liberalization, de-bureaucratization, the promotion of export diversification, the removal of national borders for trade and production factors, and creating a common political environment and legal framework to allow their economies to thrive and to converge. Regional and ultimately continental monetary union should be the last step in a long process of an ever deepening economic and political integration, in particular, as monetary union once introduced is not easily reversible. Introducing a monetary union prematurely might itself become an obstacle to economic and political integration in Africa as it would convert asymmetric shocks, which could have been absorbed by flexible exchange rates, into divisive political issues. Economic and political unity can pave the way for monetary unity, not vice versa (Friendman, 1997).

African leaders should also learn from the experience of the EMU. Given the grave macroeconomic divergence between member states and the ensuing divisive political disputes between them, it can be argued that the EMU was introduced prematurely. After the Euro's introduction and prior to the Great Recession of 2009, several member states enjoyed booms and high employment, e.g., Ireland, Portugal, and Spain, while Germany suffered from a protracted economic weakness ("sick man of Europe"). After the Great Recession, the situation reversed. In both periods, the European Central Bank was unable to address the asynchronous business cycles of the member states with its common monetary policy. Considering that the EMU's member economies were much more

converged prior to the Euro's introduction than Africa's regions are currently, monetary unions in Africa appear highly inadvisable in the near future. If African leaders are determined to press on with monetary integration, they should at least avoid creating a monetary union that lacks the necessary institutions to deal with asymmetric shocks. The EMU created some of such institutions as a lesson from its crisis, e.g., the European Stability Mechanism (ESM) and the banking union. The optimal institutional setting for monetary is, however, still subject of ongoing research and discussions between the member states of the EMU. African leaders should closely follow this discussions.

A. Appendix

	UMA	EAC	ECCAS	IGAD	ECOWAS	SADC	COMESA	CEN-SAD	Africa	Rest of World
Algeria	1.15	-	-	-	-	-	-	-	1.51	59.31
Angola	-	-	0.04	-	-	2.49	-	-	2.75	70.85
Benin	-	-	-	-	8.51	-	-	9.10	10.64	38.18
Botswana	-	-	-	-	-	-	-	-	-	-
Burkina Faso	-	-	-	-	7.59	-	-	8.08	9.17	38.18
Burundi	-	4.82	0.10	-	-	-	6.33		7.79	23.42
Cameroon	-	-	1.50	-	-	-	-	-	6.94	39.51
Cape Verde	-	-	-	-	0.53	-	-	0.91	0.93	52.51
Central African Republic	-	-	3.67	-	-	-	-	1.59	4.75	39.51
Chad	-	-	1.66	-	-	-	-	1.25	2.53	50.89
Comoros	-	-	-	-	-	-	3.77	2.36	5.73	32.44
Congo (Dem Rep.)	-	-	0.51	-	-	21.37	16.68	-	25.91	47.50
Congo (Rep.)	-	-	0.99	-	-	-	-	-	2.99	108.80
Cote d'Ivore	-	-	-	-	16.93	-	-	18.35	22.87	50.89
Djibouti	-	-	-	33.41	-	-	11.00	44.11	35.86	43.08
Egypt	-	-	-	-	-	-	1.04	1.30	2.28	35.66
Equatorial Guinea	-	-	0.05	-	-	-	-	-	1.72	103.36
Eritrea	-	-	-	-	-	-	-	-	-	-
Ethiopia	-	-	-	1.31	-	-	1.59	-	1.95	32.96
Gabon	-	-	1.46	-	-	-	-	-	2.97	71.11
Gambia	-	-	-	-	14.16	-	-	17.70	18.93	29.18
Ghana	-	-	-	-	7.51	-	-	8.11	9.77	50.36
Guinea	-	-	-	-	4.68	-	-	6.61	9.05	73.86
Guinea-Bissau	-	-	-	-	12.43	-	-	13.76	13.60	53.43
Kenya	-	5.49	-	3.08	-	-	7.48	2.76	11.72	50.17
Lesotho	-	-	-	-	-	-	-	-	-	-
Liberia	-	-	-	-	16.94	-	-	23.61	29.28	67.63
Libya	2.44	-	-	-	-	-	2.11	3.88	2.81	69.44
Madagascar	-	-	-	-	-	4.36	2.19	-	5.04	40.85
Malawi	-	-	-	-	-	16.13	7.01	-	17.91	41.10
Mali	-	-	-	-	7.55	-	-	8.47	15.71	18.87
Mauritania	3.37	-	-	-	-	-	-	12.33	15.47	116.63
Mauritius	-	-	-	-	-	7.33	3.14	-	8.26	56.88
Morocco	1.83	-	-	-	-	-	-	2.07	2.89	62.71
Mozambique	-	-	-	-	-	31.63	-	-	32.68	45.75
Namibia	-	-	-	-	-	-	-	-	-	-
Niger	-	-	-	-	5.74	-	-	9.75	6.38	24.16
Nigeria	-	-	-	-	2.14	-	-	2.38	4.56	61.64
Rwanda	-	10.78	-	-	-	-	11.80	-	13.12	22.82
Sao Tome & Principe	-	-	2.77	-	-	-	-	0.38	3.50	52.58
Senegal	-	-	-	-	10.85	-	-	12.25	13.92	39.81
Seychelles	-	-	-	-	-	10.88	6.95	-	13.17	91.47
Sierra Leone	-	-	-	-	3.90	-	-	4.44	11.08	57.25
Somalia	-	-	-	-	-	-	-	-	-	-
South Africa	-	-	-	-	-	3.71	-	-	5.68	48.83
Sudan	-	-	-	0.71	-	-	1.68	1.16	2.56	28.74
Swaziland	-	-	-	-	-	-	-	-	-	-
Tanzania	-	3.61	-	-	-	4.64	-	-	8.78	48.56
Togo	-	-	-	-	15.38	-	-	15.87	24.02	47.77
Tunisia	2.29	-	-	-	-	-	-	3.48	4.27	39.06
Uganda	-	7.01	-	5.25	-	-	7.53	-	10.38	27.40
Zambia	-	-	-	-	-	28.04	13.59	-	28.91	43.26
Zimbabwe	-	-	-	-	-	45.44	7.87	-	46.12	25.30

Table A.1.: Openness of African countries

Note: Openness: Sum of nominal exports (free on board) and nominal imports (including costs, insurance, fright) in percent of nominal GDP (2011). Numbers missing for Botswana, Eritrea, Lesotho, Namibia, Somalia, and Swaziland owing to insufficient data. Sudan excluding South Sudan.
Source: IMF Directions of Trade Statistics, World Bank World Development Indicators, own table and calculations.

		Burden of Customs Procedures Index	Export Diversification Index
	UMA		
Algeria		2.80	5.38
Libya		2.60	5.96
Mauritania		3.00	4.88
Morocco		4.30	2.89
Tunisia		3.40	2.63
ø		3.22	4.35
	EAC		
Burundi		2.90	4.03
Kenya		3.60	2.52
Rwanda		5.20	4.04
Tanzania		3.20	2.56
Uganda		3.80	2.34
ø		3.74	3.10
	ECCAS		
Angola		1.80	6.34
Burundi		2.90	4.03
Central African Republic		-	4.51
Cameroon		3.60	4.09
Chad		2.10	5.56
Congo (Dem. Rep.)		-	4.34
Equatorial Guinea		-	5.73
Gabon		3.50	5.53
Congo (Rep.)		-	5.77
Sao Tome & Principe		-	3.54
ø		2.78	4.94
	IGAD		
Djibouti		-	4.02
Eritrea		-	3.06
Ethiopia		2.90	3.93
Kenya		3.60	2.52
Sudan		-	5.98
Uganda		3.80	2.34
ø		3.43	3.64

Table A.2.: Burden of customs procedure index and trade diversification index I: UMA, EAC, ECCAS, and IGAD

Note: The index values of the Burden of customs procedure index rage between 1 for extremely inefficient and 7 for extremely efficient. Higher values of the export diversion index indicate a higher concentration of exports on only few products and lower values a higher degree of diversification of export goods.
Source: World Bank, International Monetary Fund, own figure and calculations.

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		Burden of Customs Procedures Index	Export Diversification Index
	ECOWAS		
Benin		3.00	3.78
Burkina Faso		3.60	4.00
Cape Verde		3.20	4.22
Cote d'Ivoire		3.30	3.85
Ghana		3.40	4.13
Guinea		3.30	4.24
Gambia		4.60	3.48
Guinea-Bissau		-	4.86
Liberia		3.90	4.60
Mali		3.20	3.87
Niger		-	5.37
Nigeria		3.00	5.78
Senegal		4.30	2.97
Sierra Leone		3.40	3.31
Togo		-	3.49
ø		3.52	4.13
	SADC		
Angola		1.80	6.34
Botswana		4.20	-
Congo (Dem. Rep.)		-	4.34
Lesotho		3.40	-
Madagascar		3.40	3.35
Malawi		3.80	4.43
Mauritius		4.70	3.02
Mozambique		3.50	4.13
Namibia		4.10	-
Seychelles		3.80	4.54
South Africa		4.10	2.23
Swaziland		3.50	-
Tanzania		3.20	2.56
Zambia		4.20	4.64
Zimbabwe		3.00	3.15
ø		3.62	3.88

Table A.3.: Burden of customs procedure index and trade diversification index II: ECOWAS and SADC

Note: The index values of the Burden of customs procedure index rage between 1 for extremely inefficient and 7 for extremely efficient. Higher values of the export diversion index indicate a higher concentration of exports on only few products and lower values a higher degree of diversification of export goods.
Source: World Bank, International Monetary Fund, own figure and calculations.

		Burden of Customs Procedures Index	Export Diversification Index
	COMESA		
Burundi		2.90	4.03
Comoros		-	4.17
Congo (Dem. Rep.)		-	4.34
Djibouti		-	4.02
Egypt		3.80	2.32
Eritrea		-	3.06
Ethiopia		2.90	3.93
Kenya		3.60	2.52
Libya		2.60	5.96
Madagascar		3.40	3.35
Malawi		3.80	4.43
Mauritius		4.70	3.02
Rwanda		5.20	4.04
Seychelles		3.80	4.54
Sudan		-	5.98
Swaziland		3.50	-
Uganda		3.80	2.34
Zambia		4.20	4.64
Zimbabwe		3.00	3.15
ø		3.66	3.88
	CEN-SAD		
Benin		3.00	3.78
Burkina Faso		3.60	4.00
Cape Verde		3.20	4.22
Central African Republic		-	4.51
Comoros		-	4.17
Cote d'Ivore		3.30	3.85
Chad		2.10	5.56
Djibouti		-	4.02
Egypt		3.80	2.32
Eritrea		-	3.06
Gambia		4.60	3.48
Ghana		3.40	4.13
Guinea		3.30	4.24

Table A.4.: Burden of customs procedure index and trade diversification index III: COMESA and CEN-SAD

Note: The index values of the Burden of customs procedure index rage between 1 for extremely inefficient and 7 for extremely efficient. Higher values of the export diversion index indicate a higher concentration of exports on only few products and lower values a higher degree of diversification of export goods.
Source: World Bank, International Monetary Fund, own figure and calculations.

		Burden of Customs Procedures Index	Export Diversification Index
	CEN-SAD		
Guinea-Bissau		-	4.86
Kenya		3.60	2.52
Liberia		3.90	4.60
Libya		2.60	5.96
Mali		3.20	3.87
Mauritania		3.00	4.88
Morocco		4.30	2.89
Niger		-	5.37
Nigeria		3.00	5.78
Sao Tome and Principe		-	3.54
Senegal		4.30	2.97
Sierra Leone		3.40	3.31
Sudan		-	5.98
Togo		-	3.49
Tunisia		3.40	2.63
ø		3.42	4.07
	Other		
European Monetary Union		4.94	1.94
Germany		4.70	1.63
USA		4.80	1.48

Table A.5.: Burden of customs procedure index and trade diversification index IV: CEN-SAD (continued)

Note: The index values of the Burden of customs procedure index rage between 1 for extremely inefficient and 7 for extremely efficient. Higher values of the export diversion index indicate a higher concentration of exports on only few products and lower values a higher degree of diversification of export goods.
Source: World Bank, International Monetary Fund, own figure and calculations.

	pre 1994		post 1994	
	GDP	GDP deflator	GDP	GDP deflator
UMA ↘				
Algeria	0.35 (0.05)	0.36 (0.05)	0.16 (0.47)	0.38 (0.10)
Libya	0.43 (0.02)	0.26 (0.15)	0.22 (0.34)	0.30 (0.18)
Mauritania	0.29 (0.10)	0.41 (0.02)	0.29 (0.20)	0.30 (0.19)
Morocco	0.35 (0.05)	0.47 (0.01)	0.03 (0.90)	-0.19 (0.42)
Tunisia	0.30 (0.10)	0.47 (0.01)	0.43 (0.06)	0.07 (0.77)
ø	0.34 (0.06)	0.39 (0.05)	0.23 (0.40)	0.17 (0.33)
EAC ↗				
Burundi	-0.11 (0.53)	0.04 (0.80)	0.33 (0.13)	0.09 (0.68)
Kenya	0.19 (0.30)	0.25 (0.17)	0.33 (0.13)	0.43 (0.05)
Rwanda	0.12 (0.52)	-0.16 (0.38)	0.27 (0.21)	0.41 (0.06)
Tanzania	0.31 (0.08)	0.60 (0.00)	0.54 (0.01)	0.47 (0.03)
Uganda	-0.18 (0.32)	0.39 (0.03)	0.27 (0.22)	0.08 (0.72)
ø	0.06 (0.35)	0.22 (0.28)	0.35 (0.14)	0.30 (0.31)
ECCAS →				
Angola	0.27 (0.10)	0.87 (0.00)	0.19 (0.39)	0.31 (0.16)
Burundi	0.20 (0.22)	-0.01 (0.97)	0.42 (0.05)	-0.17 (0.43)
Cameroon	0.00 (0.98)	0.18 (0.28)	0.22 (0.32)	0.74 (0.00)
Central African Republic	0.15 (0.35)	0.23 (0.16)	0.00 (1.00)	0.85 (0.00)
Chad	0.17 (0.31)	0.62 (0.00)	0.21 (0.34)	0.76 (0.00)
Congo (Dem. Rep.)	0.53 (0.00)	0.90 (0.00)	0.46 (0.04)	0.29 (0.19)
Equatorial Guinea	-0.13 (0.42)	0.56 (0.00)	-0.20 (0.35)	0.44 (0.04)
Gabon	-0.08 (0.64)	0.33 (0.04)	0.13 (0.54)	0.60 (0.01)
Congo (Rep.)	0.18 (0.28)	0.46 (0.01)	0.08 (0.70)	0.39 (0.07)
Sao Tome & Principe	-0.07 (0.69)	0.57 (0.00)	0.16 (0.45)	0.72 (0.00)
ø	0.12 (0.40)	0.47 (0.15)	0.17 (0.42)	0.49 (0.09)
IGAD →				
Djibouti	0.10 (0.53)	-0.16 (0.33)	0.04 (0.84)	0.55 (0.01)
Eritrea			-0.29 (0.18)	-0.22 (0.30)
Ethiopia	0.25 (0.12)	0.36 (0.03)	0.23 (0.29)	0.01 (0.98)
Kenya	-0.06 (0.74)	0.58 (0.00)	0.34 (0.12)	0.34 (0.12)
Sudan	-0.18 (0.27)	0.40 (0.01)	0.01 (0.95)	0.22 (0.32)
Uganda	0.10 (0.56)	0.17 (0.30)	0.42 (0.05)	0.20 (0.35)
ø	0.04 (0.44)	0.27 (0.14)	0.13 (0.41)	0.18 (0.35)

↗ - Synchronicity increased → - Synchronicity unchanged ↘ - Synchronicity declined

Table A.6.: Simple correlations I: UMA, EAC, ECCAS, and IGAD

Note: Correlation of country with aggregate of remaining REC. P-values of Q-test in parentheses. Somalia, South Sudan, Western Sahara, and Eritrea (prior to 1994) are excluded from calculations owing to insufficient data. Calculations of correlation coefficients for UMA, COMESA, and CEN-SAD end with 2010 because of the Libya war and the Arab spring revolutions.
Source: Own table.

	pre 1994		post 1994	
	GDP	GDP deflator	GDP	GDP deflator
	ECOWAS →			
Benin	0.02 (0.90)	0.27 (0.10)	-0.21 (0.33)	0.53 (0.02)
Burkina Faso	-0.06 (0.71)	0.12 (0.45)	0.23 (0.29)	0.26 (0.23)
Cape Verde	-0.10 (0.55)	0.14 (0.39)	-0.51 (0.02)	-0.38 (0.08)
Cote d'Ivore	0.21 (0.20)	0.13 (0.43)	-0.15 (0.49)	0.35 (0.11)
Gambia	-0.03 (0.83)	0.04 (0.80)	0.34 (0.12)	0.16 (0.46)
Ghana	0.23 (0.16)	0.10 (0.53)	0.44 (0.04)	0.42 (0.06)
Guinea	-0.19 (0.26)	0.12 (0.47)	-0.51 (0.02)	-0.12 (0.59)
Guinea-Bissau	-0.35 (0.03)	0.48 (0.00)	0.02 (0.91)	0.18 (0.41)
Liberia	0.10 (0.55)	0.31 (0.06)	-0.30 (0.17)	-0.32 (0.15)
Mali	0.08 (0.65)	-0.21 (0.21)	-0.17 (0.45)	0.65 (0.00)
Niger	0.20 (0.23)	0.11 (0.50)	-0.12 (0.59)	0.37 (0.09)
Nigeria	0.26 (0.12)	0.18 (0.27)	0.01 (0.96)	0.11 (0.61)
Senegal	0.02 (0.92)	0.11 (0.49)	0.32 (0.14)	0.42 (0.06)
Sierra Leone	0.18 (0.26)	0.37 (0.03)	0.23 (0.29)	0.18 (0.42)
Togo	0.08 (0.64)	0.21 (0.20)	-0.15 (0.49)	0.32 (0.14)
ø	0.04 (0.47)	0.17 (0.33)	-0.03 (0.35)	0.21 (0.23)
	SADC →			
Angola	0.22 (0.17)	0.87 (0.00)	0.66 (0.00)	0.31 (0.16)
Botswana	0.09 (0.57)	0.09 (0.60)	0.32 (0.15)	0.21 (0.33)
Congo (Dem. Rep.)	0.46 (0.00)	0.84 (0.00)	0.42 (0.06)	0.28 (0.20)
Lesotho	0.12 (0.45)	0.03 (0.86)	0.18 (0.40)	0.02 (0.91)
Madagascar	0.17 (0.31)	0.60 (0.00)	0.24 (0.27)	0.69 (0.00)
Malawi	0.08 (0.63)	0.42 (0.01)	0.07 (0.75)	0.22 (0.31)
Mauritius	-0.24 (0.15)	-0.05 (0.77)	0.08 (0.71)	0.16 (0.46)
Mozambique	0.41 (0.01)	0.26 (0.12)	-0.08 (0.73)	0.76 (0.00)
Namibia	0.47 (0.00)	0.21 (0.21)	0.48 (0.03)	0.34 (0.12)
Seychelles	-0.04 (0.79)	-0.16 (0.33)	0.36 (0.10)	-0.23 (0.29)
South Africa	0.56 (0.00)	0.02 (0.92)	0.66 (0.00)	0.38 (0.08)
Swaziland	0.24 (0.15)	0.00 (0.98)	0.26 (0.23)	0.18 (0.42)
Tanzania	0.38 (0.02)	0.26 (0.11)	0.43 (0.05)	0.64 (0.00)
Zambia	0.39 (0.02)	0.33 (0.04)	0.30 (0.16)	0.85 (0.00)
Zimbabwe	0.35 (0.03)	-0.19 (0.24)	-0.38 (0.08)	-0.14 (0.52)
ø	0.24 (0.22)	0.23 (0.35)	0.27 (0.25)	0.31 (0.25)

↗ - Synchronicity increased → - Synchronicity unchanged ↘ - Synchronicity declined

Table A.7.: Simple correlations II: ECOWAS and SADC

Note: Correlation of country with aggregate of remaining REC. P-values of Q-test in parentheses. Somalia, South Sudan, Western Sahara, and Eritrea (prior to 1994) are excluded from calculations owing to insufficient data. Calculations of correlation coefficients for UMA, COMESA, and CEN-SAD end with 2010 because of the Libya war and the Arab spring revolutions.
Source: Own table.

	pre 1994		post 1994	
	GDP	GDP deflator	GDP	GDP deflator
COMESA ↗				
Burundi	0.07 (0.67)	0.00 (0.99)	0.22 (0.34)	-0.20 (0.39)
Comoros	0.11 (0.51)	-0.01 (0.97)	0.05 (0.83)	0.51 (0.03)
Congo (Dem. Rep.)	0.13 (0.42)	0.28 (0.09)	0.48 (0.04)	0.50 (0.03)
Djibouti	0.04 (0.83)	-0.05 (0.76)	0.45 (0.05)	0.38 (0.10)
Egypt	0.18 (0.28)	0.06 (0.72)	0.50 (0.03)	0.05 (0.81)
Eritrea			-0.46 (0.05)	-0.11 (0.62)
Ethiopia	0.02 (0.92)	0.06 (0.73)	0.53 (0.02)	-0.14 (0.55)
Kenya	0.14 (0.39)	0.30 (0.06)	0.52 (0.02)	0.23 (0.31)
Libya	0.24 (0.14)	0.02 (0.90)	0.33 (0.15)	-0.09 (0.69)
Madagascar	0.30 (0.07)	0.59 (0.00)	0.45 (0.05)	0.62 (0.01)
Malawi	0.18 (0.28)	0.39 (0.02)	0.37 (0.11)	0.02 (0.93)
Mauritius	-0.14 (0.41)	-0.05 (0.77)	0.18 (0.44)	0.11 (0.64)
Rwanda	0.19 (0.24)	0.06 (0.70)	0.17 (0.45)	0.15 (0.52)
Seychelles	0.30 (0.07)	-0.16 (0.32)	0.41 (0.07)	-0.15 (0.52)
Sudan	0.03 (0.87)	0.74 (0.00)	0.40 (0.08)	0.82 (0.00)
Swaziland	-0.27 (0.10)	0.00 (1.00)	0.28 (0.22)	0.15 (0.52)
Uganda	0.15 (0.37)	-0.03 (0.84)	0.18 (0.43)	0.03 (0.91)
Zambia	0.23 (0.17)	0.31 (0.06)	0.62 (0.01)	0.85 (0.00)
Zimbabwe	-0.13 (0.44)	-0.19 (0.24)	-0.34 (0.14)	-0.16 (0.48)
ø	0.10 (0.40)	0.13 (0.51)	0.28 (0.19)	0.19 (0.43)
CEN-SAD →				
Benin	-0.05 (0.76)	0.32 (0.05)	-0.38 (0.09)	0.65 (0.00)
Burkina Faso	0.10 (0.54)	0.10 (0.54)	0.27 (0.23)	0.32 (0.16)
Cape Verde	-0.19 (0.24)	0.06 (0.72)	-0.20 (0.39)	-0.44 (0.05)
Central African Republic	0.29 (0.08)	-0.06 (0.70)	-0.42 (0.07)	0.57 (0.01)
Comoros	-0.13 (0.43)	0.00 (0.98)	-0.18 (0.43)	0.31 (0.18)
Cote d'Ivore	0.38 (0.02)	0.31 (0.06)	-0.18 (0.44)	0.50 (0.03)
Chad	0.04 (0.80)	-0.02 (0.91)	0.23 (0.31)	0.61 (0.01)
Djibouti	0.03 (0.84)	0.21 (0.20)	0.49 (0.03)	0.44 (0.05)
Egypt	0.26 (0.11)	0.60 (0.00)	0.16 (0.48)	0.10 (0.67)
Eritrea			-0.35 (0.13)	-0.19 (0.40)
Gambia	0.14 (0.38)	0.12 (0.45)	0.37 (0.10)	0.14 (0.54)
Ghana	-0.05 (0.78)	0.12 (0.47)	0.59 (0.01)	0.28 (0.22)
Guinea	-0.18 (0.29)	0.15 (0.36)	-0.54 (0.02)	-0.06 (0.80)

↗ - Synchronicity increased → - Synchronicity unchanged ↘ - Synchronicity declined

Table A.8.: Simple correlations III: COMESA and CEN-SAD

Note: Correlation of country with aggregate of remaining REC. P-values of Q-test in parentheses. Somalia, South Sudan, Western Sahara, and Eritrea (prior to 1994) are excluded from calculations owing to insufficient data. Calculations of correlation coefficients for UMA, COMESA, and CEN-SAD end with 2010 because of the Libya war and the Arab spring revolutions.
Source: Own table.

	pre 1994		post 1994	
	GDP	GDP deflator	GDP	GDP deflator
	CEN-SAD →			
Guinea-Bissau	-0.26 (0.12)	0.45 (0.01)	0.04 (0.85)	0.16 (0.48)
Kenya	0.12 (0.48)	0.61 (0.00)	0.49 (0.03)	0.31 (0.17)
Liberia	0.25 (0.13)	0.43 (0.01)	-0.31 (0.18)	-0.33 (0.15)
Libya	0.35 (0.03)	0.09 (0.60)	0.56 (0.01)	0.20 (0.39)
Mali	0.13 (0.43)	-0.21 (0.21)	-0.02 (0.94)	0.76 (0.00)
Mauritania	0.31 (0.06)	0.32 (0.05)	0.33 (0.15)	0.20 (0.37)
Morocco	0.38 (0.02)	0.32 (0.05)	0.02 (0.92)	0.03 (0.90)
Niger	0.27 (0.10)	0.19 (0.24)	-0.02 (0.92)	0.46 (0.04)
Nigeria	0.36 (0.03)	0.37 (0.02)	0.51 (0.03)	0.46 (0.04)
Sao Tome and Principe	0.46 (0.01)	0.35 (0.03)	0.51 (0.03)	0.62 (0.01)
Senegal	0.11 (0.52)	0.20 (0.23)	0.23 (0.31)	0.56 (0.01)
Sierra Leone	0.20 (0.23)	0.39 (0.02)	0.18 (0.44)	0.06 (0.80)
Sudan	0.04 (0.81)	0.43 (0.01)	0.21 (0.35)	0.54 (0.02)
Togo	0.22 (0.18)	0.35 (0.03)	-0.07 (0.75)	0.49 (0.03)
Tunisia	0.20 (0.22)	0.38 (0.02)	0.54 (0.02)	0.05 (0.82)
ø	0.14 (0.32)	0.24 (0.26)	0.11 (0.31)	0.28 (0.26)

↗ - Synchronicity increased → - Synchronicity unchanged ↘ - Synchronicity declined

Table A.9.: Simple correlations IV: CEN-SAD (continued)

Note: Correlation of country with aggregate of remaining REC. P-values of Q-test in parentheses. Somalia, South Sudan, Western Sahara, and Eritrea (prior to 1994) are excluded from calculations owing to insufficient data. Calculations of correlation coefficients for UMA, COMESA, and CEN-SAD end with 2010 because of the Libya war and the Arab spring revolutions.
Source: Own table.

	pre 1994				post 1994			
		Difference to Remaining REC in:				*Difference to Remaining REC in:*		
	Output Gap	Standard Deviation	Minimum	Maximum	Output Gap	Standard Deviation	Minimum	Maximum
	UMA →							
Algeria	0.33 (0.07)	-2.16	4.24	-3.28	0.21 (0.37)	-0.22	1.06	0.18
Libya	0.52 (0.00)	4.05	-4.70	7.47	0.27 (0.24)	1.50	-4.76	1.57
Mauritania	0.05 (0.76)	-0.30	1.18	-0.46	0.30 (0.19)	2.36	-1.85	6.79
Morocco	0.33 (0.07)	-0.90	5.35	-0.90	0.04 (0.85)	0.98	-2.37	2.14
Tunisia	0.03 (0.86)	-0.92	3.61	1.49	0.27 (0.24)	0.01	0.16	0.46
ø	0.25 (0.35)	1.67	3.82	2.72	0.22 (0.38)	1.01	2.04	2.23
	EAC ↗							
Burundi	-0.29 (0.11)	1.69	-2.59	3.81	-0.16 (0.47)	0.21	-0.79	0.62
Kenya	0.02 (0.91)	2.07	-9.75	4.57	0.38 (0.08)	0.18	-0.94	2.01
Rwanda	0.12 (0.51)	3.19	-3.76	1.85	0.55 (0.01)	4.16	-0.99	2.92
Tanzania	0.22 (0.22)	-0.48	2.21	-0.65	0.53 (0.02)	-0.67	0.63	-1.17
Uganda	-0.26 (0.14)	0.58	-0.80	1.41	0.43 (0.05)	0.38	-0.77	1.25
ø	-0.04 (0.38)	1.60	3.82	2.46	0.35 (0.13)	1.12	0.82	1.59
	ECCAS →							
Angola	0.12 (0.45)	-0.10	1.40	-2.14	0.08 (0.71)	2.21	-2.88	5.48
Burundi	-0.04 (0.86)	1.38	-1.85	4.68	-0.11 (0.61)	-0.41	-0.34	-2.11
Cameroon	-0.14 (0.38)	1.15	-2.11	1.24	0.36 (0.10)	-0.37	-0.45	-1.67
Central African Republic	0.16 (0.34)	0.14	-0.79	0.78	0.24 (0.26)	-0.23	0.92	-0.77
Chad	0.10 (0.55)	0.74	-1.56	1.40	-0.14 (0.52)	-1.09	4.73	-1.94
Congo (Dem. Rep.)	0.32 (0.05)	0.95	-5.26	1.42	-0.11 (0.61)	2.85	2.69	10.60
Equatorial Guinea	0.35 (0.03)	0.18	-1.29	2.43	0.14 (0.53)	6.33	-11.44	8.47
Gabon	-0.05 (0.77)	4.99	-7.42	23.62	0.47 (0.03)	0.18	0.88	1.74
Congo (Rep.)	0.09 (0.57)	1.75	-1.81	6.00	-0.04 (0.86)	-0.40	0.93	-1.82
Sao Tome & Principe	-0.24 (0.15)	1.44	-2.70	6.48	-0.17 (0.45)	-1.26	2.43	-2.78
ø	0.07 (0.42)	1.28	2.62	5.02	0.07 (0.47)	1.53	2.77	3.74
	IGAD ↗							
Djibouti	0.21 (0.21)	0.43	-0.04	0.97	0.14 (0.53)	-0.88	1.44	-1.40
Eritrea					-0.20 (0.36)	1.93	-4.10	4.13
Ethiopia	0.42 (0.01)	1.41	-6.99	2.36	0.35 (0.11)	1.23	-4.87	1.47
Kenya	-0.11 (0.48)	0.68	-3.62	1.16	0.46 (0.03)	-0.39	0.23	-0.06
Sudan	-0.05 (0.75)	1.69	-2.06	5.32	0.17 (0.43)	1.37	-5.81	1.25
Uganda	0.15 (0.36)	0.45	0.11	2.07	0.48 (0.03)	-0.20	0.28	-0.21
ø	0.12 (0.36)	1.50	2.26	2.58	0.23 (0.25)	1.00	2.79	1.42

↗ - Synchronicity increased → - Synchronicity unchanged ↘ - Synchronicity declined

Table A.10.: Output gap correlations I: UMA, EAC, ECCAS, and IGAD

Note: Correlation of country with aggregate of remaining REC. P-values of Q-test in parentheses. REC's average standard deviation, minimum, and maximum are calculated as the arithmetic average of absolute values of member states' differences to the remaining REC aggregate. Somalia, South Sudan, Western Sahara, and Eritrea (prior to 1994) are excluded from calculations owing to insufficient data. Calculations of correlation coefficients for UMA, COMESA, and CEN-SAD end with 2010 because of the Libya war and the Arab spring revolutions.
Source: Own table.

	pre 1994				post 1994			
	Output Gap	*Difference to Remaining REC in:*			Output Gap	*Difference to Remaining REC in:*		
		Standard Deviation	Minimum	Maximum		Standard Deviation	Minimum	Maximum
	ECOWAS →							
Benin	0.10 (0.55)	-1.16	5.75	-1.73	-0.19 (0.39)	-0.44	1.91	-0.51
Burkina Faso	-0.17 (0.30)	-1.51	6.18	-2.73	0.53 (0.02)	0.59	-0.24	0.84
Cape Verde	-0.18 (0.28)	0.59	0.68	4.00	-0.41 (0.06)	0.29	0.31	0.65
Cote d'Ivore	0.22 (0.19)	-0.69	6.88	0.94	0.18 (0.42)	1.25	-2.56	1.76
Gambia	-0.04 (0.81)	-0.90	5.18	-1.16	0.22 (0.32)	1.14	-0.53	2.82
Ghana	0.41 (0.01)	-0.52	4.89	1.71	0.23 (0.29)	0.39	0.20	1.95
Guinea	-0.37 (0.03)	-1.44	4.54	-2.32	-0.13 (0.56)	-0.34	1.58	0.09
Guinea-Bissau	-0.36 (0.03)	1.86	-2.03	6.67	-0.05 (0.82)	5.17	-9.73	15.09
Liberia	0.12 (0.45)	4.67	-10.93	19.10	-0.12 (0.59)	14.18	-25.54	28.83
Mali	0.02 (0.89)	0.08	2.91	1.43	-0.18 (0.41)	0.39	0.37	0.75
Niger	0.37 (0.02)	0.82	-1.78	1.48	-0.07 (0.73)	1.97	-3.04	4.35
Nigeria	0.30 (0.07)	4.03	-15.37	6.08	0.21 (0.33)	0.39	-1.59	1.02
Senegal	0.01 (0.95)	-1.21	6.67	-0.38	0.48 (0.03)	0.00	0.24	0.16
Sierra Leone	0.29 (0.08)	-0.61	3.70	2.89	0.01 (0.98)	2.69	-8.93	3.53
Togo	0.11 (0.50)	0.59	-4.45	0.94	0.67 (0.00)	1.56	-1.19	7.03
ø	0.06 (0.34)	1.38	5.46	3.57	0.09 (0.40)	2.05	3.86	4.63
	SADC →							
Angola	0.25 (0.12)	0.64	-1.11	-0.75	0.68 (0.00)	2.94	-4.38	6.57
Botswana	0.24 (0.14)	1.47	-2.03	5.33	0.51 (0.02)	1.40	-5.00	1.78
Congo (Dem. Rep.)	0.26 (0.12)	1.59	-8.29	2.33	-0.22 (0.32)	3.97	-0.79	12.44
Lesotho	0.00 (0.99)	3.05	-8.52	7.42	0.06 (0.77)	-0.31	-0.57	-1.21
Madagascar	0.11 (0.50)	0.69	-0.90	3.28	0.33 (0.13)	1.88	-7.18	3.94
Malawi	-0.07 (0.68)	2.16	-8.03	3.30	0.19 (0.39)	2.03	-9.26	-0.05
Mauritius	-0.24 (0.14)	1.78	-3.87	4.00	0.06 (0.78)	-0.18	0.03	-0.36
Mozambique	0.44 (0.01)	1.67	-4.78	2.64	-0.08 (0.73)	0.26	-1.94	-0.02
Namibia	0.33 (0.05)	0.53	-1.76	0.52	0.45 (0.04)	0.33	-1.59	0.06
Seychelles	-0.05 (0.76)	1.96	-3.96	6.67	0.48 (0.03)	2.49	-6.65	4.03
South Africa	0.60 (0.00)	-0.20	1.80	0.45	0.71 (0.00)	-0.67	1.76	-1.05
Swaziland	0.51 (0.00)	2.12	-3.12	5.38	0.42 (0.05)	-0.29	-1.06	-1.75
Tanzania	0.32 (0.05)	0.73	-3.29	2.30	0.38 (0.09)	-0.81	0.06	-2.34
Zambia	0.31 (0.06)	1.53	-3.49	5.98	0.26 (0.23)	0.39	-3.61	-0.13
Zimbabwe	0.48 (0.00)	2.46	-5.26	3.78	-0.05 (0.83)	3.26	-10.44	3.62
ø	0.23 (0.24)	1.50	4.01	3.61	0.28 (0.29)	1.42	3.62	2.62

↗ - Synchronicity increased → - Synchronicity unchanged ↘ - Synchronicity declined

Table A.11.: Output gap correlations II: ECOWAS and SADC

Note: Correlation of country with aggregate of remaining REC. P-values of Q-test in parentheses. REC's average standard deviation, minimum, and maximum are calculated as the arithmetic average of absolute values of member states' differences to the remaining REC aggregate. Somalia, South Sudan, Western Sahara, and Eritrea (prior to 1994) are excluded from calculations owing to insufficient data. Calculations of correlation coefficients for UMA, COMESA, and CEN-SAD end with 2010 because of the Libya war and the Arab spring revolutions.
Source: Own table.

	pre 1994				post 1994			
	Output Gap	*Difference to Remaining REC in:*			Output Gap	*Difference to Remaining REC in:*		
		Standard Deviation	Minimum	Maximum		Standard Deviation	Minimum	Maximum
	COMESA ↗							
Burundi	0.11 (0.52)	1.64	-4.10	4.74	-0.28 (0.22)	0.14	-0.08	0.43
Comoros	-0.26 (0.11)	0.35	-1.14	2.09	-0.17 (0.47)	-0.10	-0.51	-0.57
Congo (Dem. Rep.)	-0.10 (0.55)	0.94	-6.26	2.17	-0.37 (0.10)	4.13	-0.67	13.55
Djibouti	0.10 (0.55)	0.51	-2.41	1.48	0.11 (0.63)	-0.54	1.00	-0.59
Egypt	0.38 (0.02)	-0.15	-1.18	0.45	0.42 (0.06)	-0.22	0.66	-0.75
Eritrea					-0.43 (0.06)	2.24	-4.53	4.86
Ethiopia	-0.11 (0.51)	1.17	-7.22	2.61	0.37 (0.10)	1.68	-5.52	2.55
Kenya	-0.08 (0.63)	1.27	-6.94	3.20	0.51 (0.03)	0.20	-0.23	1.25
Libya	0.09 (0.57)	4.95	-9.26	9.19	0.15 (0.50)	1.39	-5.32	1.80
Madagascar	0.23 (0.16)	0.21	0.16	2.98	0.58 (0.01)	2.25	-7.16	5.00
Malawi	-0.01 (0.95)	1.71	-7.05	3.09	0.40 (0.08)	2.38	-9.13	1.04
Mauritius	-0.10 (0.55)	1.33	-2.85	3.69	0.31 (0.18)	0.04	0.20	0.73
Rwanda	0.14 (0.38)	3.10	-16.69	6.92	0.29 (0.21)	4.11	-18.69	2.49
Seychelles	0.29 (0.08)	1.52	-2.97	6.47	0.55 (0.02)	2.89	-6.47	5.15
Sudan	-0.02 (0.92)	1.87	-4.02	5.10	0.61 (0.01)	0.72	-0.59	2.69
Swaziland	-0.25 (0.12)	1.66	-2.11	5.15	0.81 (0.00)	-0.26	-0.56	-0.65
Uganda	0.07 (0.67)	0.48	-2.37	1.83	0.27 (0.24)	0.21	-0.41	0.88
Zambia	0.02 (0.88)	1.00	-2.48	5.47	0.40 (0.08)	0.49	-3.44	0.98
Zimbabwe	-0.29 (0.08)	1.87	-3.94	3.13	-0.10 (0.66)	3.43	-10.17	4.76
ø	0.01 (0.46)	1.58	4.45	3.84	0.23 (0.19)	1.44	3.97	2.67
	CEN-SAD →							
Benin	-0.02 (0.91)	0.10	0.59	1.29	-0.23 (0.31)	-0.20	1.21	0.35
Burkina Faso	0.01 (0.94)	-0.23	1.01	0.22	0.54 (0.02)	0.79	-0.91	1.75
Cape Verde	-0.31 (0.06)	1.81	-4.32	6.86	0.05 (0.82)	0.60	-0.33	1.50
Central African Republic	0.26 (0.12)	0.22	-0.98	0.56	-0.25 (0.28)	1.35	-1.93	2.86
Comoros	-0.41 (0.01)	0.03	0.79	1.85	-0.32 (0.17)	0.14	0.06	0.35
Cote d'Ivore	0.31 (0.06)	0.82	0.53	3.70	0.43 (0.06)	1.23	-2.29	2.80
Chad	0.34 (0.04)	0.79	-1.58	1.35	0.05 (0.82)	0.39	1.65	2.08
Djibouti	0.06 (0.73)	0.19	-0.52	1.23	0.13 (0.58)	-0.30	1.57	0.33
Egypt	0.63 (0.00)	-0.34	0.82	0.43	0.01 (0.97)	0.11	0.85	0.91
Eritrea					-0.23 (0.32)	2.49	-3.96	5.78
Gambia	0.21 (0.19)	0.32	0.18	1.70	0.27 (0.25)	1.37	-1.16	3.63
Ghana	0.10 (0.53)	0.79	-0.38	4.59	0.06 (0.78)	0.09	-0.55	-0.16
Guinea	-0.29 (0.08)	-0.18	-0.61	0.64	-0.19 (0.41)	-0.08	0.89	0.94

↗ - Synchronicity increased → - Synchronicity unchanged ↘ - Synchronicity declined

Table A.12.: Output gap correlations III: COMESA and CEN-SAD

Note: Correlation of country with aggregate of remaining REC. P-values of Q-test in parentheses. REC's average standard deviation, minimum, and maximum are calculated as the arithmetic average of absolute values of member states' differences to the remaining REC aggregate. Somalia, South Sudan, Western Sahara, and Eritrea (prior to 1994) are excluded from calculations owing to insufficient data. Calculations of correlation coefficients for UMA, COMESA, and CEN-SAD end with 2010 because of the Libya war and the Arab spring revolutions.
Source: Own table.

	pre 1994				post 1994			
	Output Gap	*Difference to Remaining REC in:*			Output Gap	*Difference to Remaining REC in:*		
		Standard Deviation	Minimum	Maximum		Standard Deviation	Minimum	Maximum
	CEN-SAD →							
Guinea-Bissau	-0.15 (0.37)	3.09	-7.07	9.56	-0.08 (0.74)	5.74	-10.37	15.93
Kenya	-0.12 (0.48)	0.99	-5.44	2.96	0.43 (0.06)	0.44	0.35	2.20
Liberia	0.09 (0.58)	5.91	-16.01	22.01	0.00 (0.99)	15.29	-26.26	29.70
Libya	0.30 (0.07)	3.89	-6.34	7.06	0.51 (0.03)	1.72	-5.37	2.53
Mali	0.15 (0.36)	1.37	-2.33	4.42	-0.03 (0.88)	0.61	-0.33	1.67
Mauritania	0.28 (0.09)	1.33	-6.68	4.70	0.31 (0.17)	2.57	-2.07	7.08
Morocco	0.38 (0.02)	0.32	-0.12	0.71	0.01 (0.98)	1.23	-2.84	2.64
Niger	0.33 (0.05)	2.09	-7.08	4.34	0.09 (0.68)	2.01	-3.71	5.24
Nigeria	0.28 (0.08)	3.63	-13.53	6.61	0.33 (0.15)	0.58	-2.18	1.31
Sao Tome and Principe	0.46 (0.01)	1.46	-2.90	6.24	0.12 (0.61)	0.21	-0.34	0.80
Senegal	0.10 (0.56)	0.16	0.94	2.73	0.39 (0.09)	0.31	-0.41	1.04
Sierra Leone	0.18 (0.28)	0.63	-1.35	5.79	-0.14 (0.54)	2.87	-9.61	3.90
Sudan	-0.02 (0.88)	1.55	-1.96	4.82	0.36 (0.12)	0.92	-0.03	3.64
Togo	0.11 (0.50)	1.84	-9.52	3.97	0.54 (0.02)	1.93	-1.82	7.87
Tunisia	-0.11 (0.49)	-0.26	2.56	2.90	0.71 (0.00)	0.29	-0.05	0.91
ø	0.12 (0.31)	1.37	3.45	4.15	0.14 (0.42)	1.64	2.97	3.92

↗ - Synchronicity increased → - Synchronicity unchanged ↘ - Synchronicity declined

Table A.13.: Output gap correlations IV: CEN-SAD (continued)

Note: Correlation of country with aggregate of remaining REC. P-values of Q-test in parentheses. REC's average standard deviation, minimum, and maximum are calculated as the arithmetic average of absolute values of member states' differences to the remaining REC aggregate. Somalia, South Sudan, Western Sahara, and Eritrea (prior to 1994) are excluded from calculations owing to insufficient data. Calculations of correlation coefficients for UMA, COMESA, and CEN-SAD end with 2010 because of the Libya war and the Arab spring revolutions.

	pre 1994		post 1994	
	GDP	GDP deflator	GDP	GDP deflator
CAEMU	→			
Cameroon	-0.15 (0.36)	0.44 (0.01)	0.22 (0.31)	0.58 (0.01)
Central African Republic	0.31 (0.06)	0.44 (0.01)	-0.19 (0.37)	0.52 (0.02)
Chad	0.09 (0.58)	0.61 (0.00)	0.45 (0.04)	0.58 (0.01)
Equatorial Guinea	-0.08 (0.61)	0.50 (0.00)	0.07 (0.74)	0.87 (0.00)
Gabon	-0.14 (0.39)	0.56 (0.00)	-0.05 (0.83)	0.93 (0.00)
Congo (Rep.)	0.27 (0.11)	0.61 (0.00)	-0.11 (0.61)	0.87 (0.00)
ø	0.05 (0.35)	0.53 (0.00)	0.07 (0.48)	0.72 (0.01)
CMA	↗			
Lesotho	0.09 (0.57)	0.65 (0.00)	0.17 (0.45)	0.54 (0.01)
Namibia	0.43 (0.01)	0.73 (0.00)	0.54 (0.01)	0.41 (0.06)
South Africa	0.41 (0.01)	0.80 (0.00)	0.59 (0.01)	0.50 (0.02)
Swaziland	0.19 (0.25)	0.08 (0.63)	0.30 (0.16)	0.40 (0.07)
ø	0.28 (0.21)	0.57 (0.16)	0.40 (0.16)	0.46 (0.04)
WAEMU	↗			
Benin	-0.17 (0.31)	0.78 (0.00)	0.37 (0.09)	0.97 (0.00)
Burkina Faso	0.14 (0.39)	0.66 (0.00)	0.62 (0.00)	0.74 (0.00)
Côte d'Ivore	0.26 (0.12)	0.88 (0.00)	0.39 (0.07)	0.98 (0.00)
Guinea Bissau	0.10 (0.55)	-0.33 (0.04)	-0.11 (0.61)	0.06 (0.77)
Mali	0.05 (0.76)	0.31 (0.06)	-0.07 (0.76)	0.81 (0.00)
Niger	0.24 (0.14)	0.70 (0.00)	0.26 (0.24)	0.85 (0.00)
Senegal	0.27 (0.11)	0.83 (0.00)	0.13 (0.54)	0.98 (0.00)
Togo	0.02 (0.89)	0.71 (0.00)	0.18 (0.42)	0.88 (0.00)
ø	0.11 (0.41)	0.57 (0.01)	0.22 (0.34)	0.78 (0.10)

↗ - Synchronicity increased → - Synchronicity unchanged ↘ - Synchronicity declined

Table A.14.: Simple correlations: existing African monetary unions

Note: Correlation of country with aggregate of remaining monetary union. P-values of Q-test in parentheses.
Source: Own table.

	pre 1994				post 1994			
	Output Gap	*Difference to Remaining REC in:*			Output Gap	*Difference to Remaining REC in:*		
		Standard Deviation	Minimum	Maximum		Standard Deviation	Minimum	Maximum
	CAEMU →							
Cameroon	-0.32 (0.06)	-1.54	1.85	-11.63	0.25 (0.26)	-1.74	2.31	-4.47
Central African Republic	0.30 (0.07)	-0.46	0.65	-5.22	-0.13 (0.56)	0.13	-0.67	0.05
Chad	0.32 (0.05)	0.20	-0.41	-4.27	-0.09 (0.69)	-0.43	2.54	0.39
Equatorial Guinea	0.24 (0.14)	-0.39	-0.12	-3.27	0.26 (0.23)	7.24	-13.85	9.61
Gabon	-0.11 (0.52)	5.20	-7.58	23.21	0.36 (0.10)	0.57	-1.60	2.36
Congo (Rep.)	0.14 (0.38)	1.09	-0.08	-0.20	-0.05 (0.82)	-0.11	-0.10	-0.93
ø	0.10 (0.20)	1.48	1.78	7.97	0.10 (0.44)	1.70	3.51	2.97
	CMA ↗							
Lesotho	-0.07 (0.66)	2.98	-9.02	6.79	0.13 (0.55)	-0.21	-0.41	-0.88
Namibia	0.28 (0.09)	0.45	-2.19	-0.12	0.51 (0.02)	0.43	-1.48	0.41
South Africa	0.38 (0.02)	-0.31	2.63	-0.05	0.57 (0.01)	0.04	0.47	0.56
Swaziland	0.49 (0.00)	2.05	-3.63	4.76	0.29 (0.19)	-0.21	-0.74	-1.41
ø	0.27 (0.19)	1.45	4.37	2.93	0.37 (0.19)	0.22	0.77	0.81
	WAEMU ↗							
Benin	-0.19 (0.13)	0.38	-1.61	0.05	0.23 (0.00)	-0.78	2.38	-1.18
Burkina Faso	0.25 (0.25)	0.11	-1.45	-0.87	0.70 (0.29)	0.34	0.08	0.45
Côte d'Ivore	0.43 (0.01)	1.75	-1.69	5.32	0.66 (0.00)	1.47	-3.39	2.43
Guinea-Bissau	0.17 (0.30)	3.49	-9.33	8.71	-0.11 (0.61)	4.89	-9.37	14.50
Mali	0.11 (0.51)	1.70	-3.95	3.79	0.09 (0.68)	0.03	0.72	0.20
Niger	0.39 (0.02)	2.51	-9.34	3.72	0.34 (0.12)	1.74	-2.51	3.88
Senegal	0.29 (0.08)	0.45	-1.11	-1.11	0.29 (0.18)	-0.44	0.84	0.84
Togo	0.03 (0.88)	2.17	-11.85	-11.85	0.58 (0.01)	1.30	-0.81	-0.81
ø	0.18 (0.27)	1.57	5.04	4.42	0.35 (0.24)	1.37	2.51	4.97

↗ - Synchronicity increased → - Synchronicity unchanged ↘ - Synchronicity declined

Table A.15.: Output gap correlations: existing African monetary unions

Note: Correlation of country with aggregate of remaining monetary union. P-values of Q-test in parentheses. REC's average standard deviation, minimum, and maximum are calculated as the arithmetic average of absolute values of member states' differences to the remaining REC aggregate.

	year	gap	Δ gap	Δ π	IR
UMA					
Algeria	1993	-0.95	-2.45	-8.07	**0.28**
Libya	2002	-7.09	-4.33	20.06	**-0.29**
Mauritania	1997	-2.56	-6.89	8.28	**-0.15**
Morocco	1995	-5.33	-9.03	4.11	**-0.07**
Tunisia	2002	-1.70	-2.69	-1.16	**0.06**
ø					**-0.03**
EAC					
Burundi	2003	-1.52	-3.36	10.92	**-0.36**
Kenya	2008	0.11	-2.89	7.80	**-0.29**
Rwanda	1994	-20.43	-19.56	21.97	**-0.10**
Tanzania	1992	0.18	-1.79	5.52	**-0.11**
Uganda	1992	-2.43	-2.85	18.07	**-0.07**
ø					**-0.18**
ECCAS					
Angola	2009	2.19	-6.48	-19.81	**0.08**
Burundi	2003	-1.52	-3.36	10.92	**-0.36**
Cameroon	1994	-3.56	-2.03	-3.52	**0.24**
Central African Republic	1996	-2.93	-6.63	-13.44	**0.26**
Chad	1993	-8.82	-17.58	4.75	**-0.06**
Congo (Dem. Rep.)	2003	-1.04	-7.35	-12.25	**0.00**
Equatorial Guinea	2006	-16.47	-25.84	-6.92	**0.02**
Gabon	1999	-2.34	-8.78	31.89	**-0.42**
Congo (Rep.)	2007	-2.94	-6.01	-29.55	**0.72**
Sao Tome & Principe	2007	-2.58	-2.60	-1.03	**0.03**
ø					**0.05**
IGAD					
Djibouti	1993	-1.29	-3.74	1.00	**-0.05**
Eritrea	2008	-6.22	-10.01	5.51	**-0.04**
Ethiopia	2003	-7.30	-8.29	16.39	**-0.38**
Kenya	2008	0.11	-2.89	7.80	**-0.29**
Sudan	2011	-8.91	-7.68	3.36	**-0.02**
Uganda	1992	-2.43	-2.85	18.07	**-0.07**
ø					**-0.14**

Table A.16.: Contemporary inflation response to severest downturn since 1992 I: UMA, EAC, ECCAS, and IGAD

Note: Right column displays the contemporary change in inflation relative to the average inflation rate relative to the size of the change in the output gap. Inflation measured as the annual rate of change of the deflator of total sales. Owing to lack of data, the inflation of Algeria, Cape Verde, the Central African Republic, Chad, Comoros, Djibouti, Ethiopia, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Libya, Mali, Niger, Nigeria, Malawi, Sao Tome and Principe, Seychelles, and Tunisia is measured as the annual rate of change of the GDP deflator.
Source: World Bank, own table and calculations.

	year	gap	Δ gap	Δ π	IR
	ECOWAS				
Benin	1994	-1.07	-2.36	42.68	**-2.96**
Burkina Faso	2000	-1.27	-3.87	-4.96	**0.25**
Cape Verde	2009	-0.04	-1.92	-1.37	**0.17**
Cote d'Ivore	2011	-5.59	-7.51	-3.75	**0.08**
Gambia	2011	-3.16	-7.63	-1.66	**0.02**
Ghana	2009	-2.75	-3.47	-2.97	**0.03**
Guinea	2009	-0.82	-2.61	-7.30	**0.21**
Guinea-Bissau	1998	-12.63	-29.40	-26.06	**0.03**
Liberia	2003	-11.16	-41.70	8.93	**-0.06**
Mali	1994	-2.60	-2.00	25.27	**-1.56**
Niger	2010	-5.97	-9.41	-3.52	**0.07**
Nigeria	2002	-4.13	-3.59	40.22	**-0.55**
Senegal	2002	-2.64	-3.60	-0.29	**0.01**
Sierra Leone	1992	-7.00	-16.38	-30.14	**0.05**
Togo	1993	-15.19	-16.42	-6.47	**0.08**
ø					**-0.28**
	SADC				
Angola	2009	2.19	-6.48	-19.81	**-0.08**
Botswana	2009	-6.59	-11.20	-1.03	**-0.01**
Congo (Dem. Rep.)	2003	-1.04	-7.35	-12.25	**0.00**
Lesotho	1999	-2.09	-2.30	-24.64	**-1.01**
Madagascar	2002	-8.69	-15.45	7.63	**0.04**
Malawi	1994	-10.79	-13.97	-2.00	**-0.01**
Mauritius	2005	-1.23	-2.49	0.47	**0.02**
Mozambique	1992	-5.26	-8.61	-15.55	**-0.04**
Namibia	1993	-2.48	-6.12	-0.65	**-0.01**
Seychelles	2003	-4.27	-6.66	2.33	**0.05**
South Africa	2009	-1.66	-4.18	-8.97	**-0.20**
Swaziland	2012	-2.58	-2.83	15.29	**0.51**
Tanzania	1994	-20.43	-19.56	21.97	**-0.07**
Zambia	2003	-1.04	-7.35	-12.25	**0.00**
Zimbabwe	2008	-11.98	-16.19	5.75	**0.28**
ø					**-0.04**

Table A.17.: Contemporary inflation response to severest downturn since 1992 II: ECOWAS and SADC

Note: Right column displays the contemporary change in inflation relative to the average inflation rate relative to the size of the change in the output gap. Inflation measured as the annual rate of change of the deflator of total sales. Owing to lack of data, the inflation of Algeria, Cape Verde, the Central African Republic, Chad, Comoros, Djibouti, Ethiopia, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Libya, Mali, Niger, Nigeria, Malawi, Sao Tome and Principe, Seychelles, and Tunisia is measured as the annual rate of change of the GDP deflator.
Source: World Bank, own table and calculations.

COMESA					
Burundi	2003	-1.52	-3.36	10.92	**-0.36**
Comoros	1994	-2.19	-6.19	6.58	**-0.18**
Congo (Dem. Rep.)	2003	-1.04	-7.35	-12.25	**0.00**
Djibouti	1993	-1.29	-3.74	1.00	**-0.05**
Egypt	2011	-0.07	-1.97	0.88	**-0.05**
Eritrea	2008	-6.22	-10.01	5.51	**-0.04**
Ethiopia	2003	-7.30	-8.29	16.39	**-0.38**
Kenya	2008	0.11	-2.89	7.80	**-0.29**
Libya	2002	-7.09	-4.33	20.06	**-0.29**
Madagascar	2002	-8.69	-15.45	7.63	**-0.04**
Malawi	1994	-10.79	-13.97	-2.00	**0.01**
Mauritius	2005	-1.23	-2.49	0.47	**-0.02**
Rwanda	1994	-20.43	-19.56	21.97	**-0.10**
Seychelles	2003	-4.27	-6.66	2.33	**-0.05**
Sudan	2011	-8.91	-7.68	3.36	**-0.02**
Swaziland	2012	-2.58	-2.83	15.29	**-0.51**
Uganda	1992	-2.43	-2.85	18.07	**-0.07**
Zambia	2003	-1.04	-7.35	-12.25	**0.00**
Zimbabwe	2008	-11.98	-16.19	5.75	**-0.28**
ø					**-0.14**
CEN-SAD					
Benin	1994	-1.07	-2.36	42.68	**-2.96**
Burkina Faso	2000	-1.27	-3.87	-4.96	**0.25**
Cape Verde	2009	-0.04	-1.92	-1.37	**0.17**
Central African Republic	1996	-2.93	-6.63	-13.44	**0.26**
Comoros	1994	-2.19	-6.19	6.58	**-0.18**
Cote d'Ivore	2011	-5.59	-7.51	-3.75	**0.08**
Chad	1993	-8.82	-17.58	4.75	**-0.06**
Djibouti	1993	-1.29	-3.74	1.00	**-0.05**
Egypt	2011	-0.07	-1.97	0.88	**-0.05**
Eritrea	2008	-6.22	-10.01	5.51	**-0.04**
Gambia	2011	-3.16	-7.63	-1.66	**0.02**
Ghana	2009	-2.75	-3.47	-2.97	**0.03**
Guinea	2009	-0.82	-2.61	-7.30	**0.21**

Table A.18.: Contemporary inflation response to severest downturn since 1992 III: COMESA and CEN-SAD

Note: Right column displays the contemporary change in inflation relative to the average inflation rate relative to the size of the change in the output gap. Inflation measured as the annual rate of change of the deflator of total sales. Owing to lack of data, the inflation of Algeria, Cape Verde, the Central African Republic, Chad, Comoros, Djibouti, Ethiopia, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Libya, Mali, Niger, Nigeria, Malawi, Sao Tome and Principe, Seychelles, and Tunisia is measured as the annual rate of change of the GDP deflator.
Source: World Bank, own table and calculations.

	year	gap	Δ gap	Δ π	IR
	CEN-SAD				
Guinea-Bissau	1998	-12.63	-29.40	-26.06	**0.03**
Kenya	2008	0.11	-2.89	7.80	**-0.29**
Liberia	2003	-11.16	-41.70	8.93	**-0.06**
Libya	2002	-7.09	-4.33	20.06	**-0.29**
Mali	1994	-2.60	-2.00	25.27	**-1.56**
Mauritania	1997	-2.56	-6.89	8.28	**-0.15**
Morocco	1995	-5.33	-9.03	4.11	**-0.07**
Niger	2010	-5.97	-9.41	-3.52	**0.07**
Nigeria	2002	-4.13	-3.59	40.22	**-0.55**
Sao Tome and Principe	2007	-2.58	-2.60	-1.03	**0.03**
Senegal	2002	-2.64	-3.60	-0.29	**0.01**
Sierra Leone	1992	-7.00	-16.38	-30.14	**0.05**
Sudan	2011	-8.91	-7.68	3.36	**-0.02**
Togo	1993	-15.19	-16.42	-6.47	**0.08**
Tunisia	2002	-1.70	-2.69	-1.16	**0.06**
ø					**-0.18**
	Other				
European Monetary Union	2009	-2.58	-4.78	-3.61	**0.49**
Germany	2009	-3.92	-6.51	-1.90	**0.11**
USA	2009	-2.48	-3.38	-4.00	**0.31**

Table A.19.: Contemporary inflation response to severest downturn since 1992 IV: CEN-SAD (continued)

Note: Right column displays the contemporary change in inflation relative to the average inflation rate relative to the size of the change in the output gap. Inflation measured as the annual rate of change of the deflator of total sales. Owing to lack of data, the inflation of Algeria, Cape Verde, the Central African Republic, Chad, Comoros, Djibouti, Ethiopia, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Libya, Mali, Niger, Nigeria, Malawi, Sao Tome and Principe, Seychelles, and Tunisia is measured as the annual rate of change of the GDP deflator.
Source: World Bank, own table and calculations.

	Hybrid Phillips Curve										Backward-looking Phillips Curve							
	sample period	constant	gap	gap_{t-1}	gap_{t-2}	π_{t-1}	$E(\pi_{t+1})$	Δ oil	contemp. Resp. rel. to av. Infl. (ρ)	VIF	sample period	constant	gap	gap_{t-1}	gap_{t-2}	π_{t-1}	Δ oil	contemp. Resp. rel. to av. Infl. (ρ)
	UMA																	
Algeria	2002-2012	-	2.49	-	-	-	0.36	0.25	**0.28**	1.17	1966-2012	-	-	-	-	0.26	0.30	**0.00**
Libya	2002-2010	-	-	-	-	-	-	0.50	**0.00**	1.62	2000-2010	-	-2.95			0.26	0.53	**-0.26**
Mauritania	2002-2012	5.69	-	-	-	-	-	0.18	**0.00**	6.31	1962-2012	-	-	-	-	-	-	**0.00**
Morocco	2002-2012	-	-	-	-	0.32	-	0.09	**0.00**	2.05	1961-2012	3.52	-	-	-	0.30	0.10	**0.00**
Tunisia	2002-2012	-	-	-	-	-	0.62	0.03	**0.00**	1.42	1967-2012	3.08	-0.28	0.42	-	0.47	0.04	**-0.13**
Ø									**0.06**									**-0.08**
	EAC																	
Burundi	2002-2012	-	-	-	-	-	1.36	-	**0.00**	3.98	1998-2012	8.66	-	-	-	-	0.22	**0.00**
Kenya	2002-2012	-	-	-	-	-	-	-	**0.00**	2.06	1962-2012	-	-0.54	0.79	-	0.22	0.06	**-0.06**
Rwanda	2002-2012	8.99	-2.93	-	-	-	-	-	**-0.33**	1.25	1962-2012	5.88	-1.39	0.58	-0.39	-	0.05	**-0.39**
Tanzania	2002-2012	10.67	20.92	-	-	-	-	-0.30	**1.83**	1.23	1991-2012	-	-	-	-	0.88	-	**0.00**
Uganda	2002-2012	-	4.77	-	-	-	-	-0.15	**0.50**	2.20	1994-2012	-	3.68	-	-	-	-0.10	**0.47**
Ø									**0.40**									**0.00**
	ECCAS																	
Angola	2002-2012	-	-	-	-	-	1.52	0.30	**0.00**	3.45	2001-2012	-	-	-	-	0.58	-	**0.00**
Burundi	2002-2012	-	-	-	-	-	1.36	-	**0.00**	3.98	1998-2012	8.66	-	-	-	-	0.22	**0.00**
Cameroon	2002-2012	-	-	-	-	0.48	-	0.08	**0.00**	2.54	1966-2012	9.90	-1.34	-0.88	-	-	-	**-0.23**
Central African Republic	2002-2012	-	-0.91	-	-	-	0.77	-	**-0.45**	1.54	1962-2012	3.75	-	-	-0.65	-	-	**0.00**
Chad	2002-2012	-	0.48	-	-	0.21	-	0.20	**0.08**	1.34	1962-2012	5.50	-	-	-	-	-	**0.00**
Congo (Dem. Rep.)	2002-2012	-	-	-	-	-	2.87	-	**0.00**	2.41	1962-2012	15.67	-	-	-	0.54	-	**0.00**
Equatorial Guinea	2002-2012	-0.83	-	0.21	0.19	-	-	0.38	**0.00**	1.31	1981-2012	-	-	-	-	0.52	0.39	**0.00**
Gabon	2002-2012	-	-	-	0.70	-	-	0.33	**0.00**	1.10	1962-2012	-	0.30	-	-	-	0.39	**0.04**
Congo (Rep.)	2002-2012	-	2.06	-	-	-	-	0.35	**0.30**	1.10	1962-2012	1.85	0.50	-	-	-	0.41	**0.28**
Sao Tome & Principe	2002-2012	-	-	-	-	-	0.35	-	**0.00**	2.50	2002-2012	8.25	-	-2.02	-	0.28	-	**0.00**
Ø									**-0.01**									**0.01**
	IGAD																	
Djibouti	2002-2012	-	-	5.24	-	-	1.45	-	**0.00**	5.61	1991-2012	-	-	-	-	0.46	-	**0.00**
Eritrea	2002-2011	15.25	-	-	-	-	-	-	**0.00**	1.74	1993-2011	43.89	-	-	-	-	-	**0.00**
Ethiopia	2002-2012	-156.08	-	-	-	-	-	-	**0.00**	1.93	1982-2012	-	-	-	-	-	-	**0.00**
Kenya	2002-2012	-	-	-	-	-	-	-	**0.00**	2.06	1962-2012	-	-0.54	0.79	-	0.22	0.06	**-0.06**
Sudan	2002-2012	-	-0.80	-	-	-	-	0.08	**-0.05**	5.67	1962-2012	4.69	-0.83	0.91	-	0.71	-	**-0.03**
Uganda	2002-2012	-	4.77	-	-	-	-	-0.15	**0.50**	2.20	1994-2012	-	3.68	-	-	-	-0.10	**0.47**
Ø									**0.07**									**0.06**

Table A.20.: Phillips Curve estimates I: UMA, EAC, ECCAS, and IGAD

Note: Coefficient estimated displayed are at least significant on a 10% level. Inflation measured as the annual rate of change of the deflator of total sales. Owing to lack of data, the inflation of Algeria, Cape Verde, the Central African Republic, Chad, Comoros, Djibouti, Ethiopia, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Libya, Mali, Niger, Nigeria, Malawi, Sao Tome and Principe, Seychelles, and Tunisia is measured as the annual rate of change of the GDP deflator.
Source: World Bank, own table and calculations.

	Hybrid Phillips Curve										Backward-looking Phillips Curve							
	sample period	constant	gap	gap_{t-1}	gap_{t-2}	π_{t-1}	$E(\pi_{t+1})$	Δ oil	contemp. Resp. rel. to av. Infl. (ρ)	VIF	sample period	constant	gap	gap_{t-1}	gap_{t-2}	π_{t-1}	Δ oil	contemp. Resp. rel. to av. Infl. (ρ)
	ECOWAS																	
Benin	2002-2012	-	-1.12	-	-	-	0.92	-	**-0.39**	3.57	1962-2012	1.18	-	-	-	0.57	-	**0.00**
Burkina Faso	2002-2012	-	-	-	-	-	1.02	-	**0.00**	2.93	1967-2012	1.47	-	0.78	0.60	0.50	-	**0.00**
Cape Verde	2002-2012	3.50	2.98	-	-	-0.55	-	-	**1.70**	3.18	1981-2012	30.36	-	-	-	-	-	**0.00**
Cote d'Ivore	2002-2012	-	-	-	-	-	1.29	-	**0.00**	1.21	1962-2012	2.81	-	-	-	0.11	-	**0.00**
Gambia	2002-2012	9.23	-	-	-	-	1.45	-	**0.00**	1.89	1986-2012	7.33	-	-	-1.40	-	-	**0.00**
Ghana	2002-2012	29.57	-	-	0.76	-	0.85	-	**0.00**	1.10	1962-2012	63.08	-	-	-	-	-	**0.00**
Guinea	2002-2012	-	-	-	-	-	1.51	-	**0.00**	9.92	1988-2012	-	-	-	-	0.98	0.09	**0.00**
Guinea-Bissau	2002-2012	-	3.65	-1.09	-	-	-	0.07	**1.53**	1.44	1998-2012	3.82	-	-	-	-	-	**0.00**
Liberia	2002-2012	7.02	-	-	-	-	-	-	**0.00**	21.23	1962-2012	-	-	-0.10	-	-	0.09	**0.00**
Mali	2002-2012	-	-	-	-	-	-	-	**0.00**	1.83	1969-2012	-	-	0.37	-	-	-	**0.00**
Niger	2002-2012	-	-	-	-	-	1.80	-	**0.00**	3.70	1962-2012	2.27	-	0.21	-	-	-	**0.00**
Nigeria	2002-2012	-	-	-	-	-	1.28	-	**0.00**	3.35	1962-2012	-10.54	-	-	-	-	0.17	**0.00**
Senegal	2002-2012	-	-	-	-	-	-	0.14	**0.00**	1.51	1962-2012	-	-	-	-	0.76	0.08	**0.00**
Sierra Leone	2002-2012	-	-	0.36	-	-0.18	-	0.14	**0.00**	1.79	1969-2012	-	-	-	-1.67	0.96	-	**0.00**
Togo	2002-2012	-	-	-	-	-	-	0.20	**0.00**	1.25	1962-2012	2.32	-	0.33	-	0.13	0.09	**0.00**
Ø									**0.19**									**0.00**
	SADC																	
Angola	2002-2012	-	-	-	-	-	1.52	0.30	**0.00**	3.45	2001-2012	-	-	-	-	0.58	-	**0.00**
Botswana	2002-2012	-	-	-	-	-	1.23	-	**0.00**	2.46	1977-2012	7.00	-	-	-	0.29	-	**0.00**
Congo (Dem. Rep.)	2002-2012	-	-	-	-	-	2.87	-	**0.00**	2.41	1962-2012	15.67	-	-	-	0.54	-	**0.00**
Lesotho	2002-2012	17.72	-	-	-2.43	-	-	-	**0.00**	4.99	1962-2012	11.10	-	-	-	-	-	**0.00**
Madagascar	2002-2012	66.09	-	-	-1.42	-	-	-	**0.00**	1.95	1962-2012	3.15	-	-	-	0.60	-	**0.00**
Malawi	2002-2012	7.34	-3.08	-	-	-	0.52	-	**-0.19**	1.73	1962-2012	-8.21	-0.63	-	-	-	0.04	**-0.04**
Mauritius	2002-2012	-	-	-	-	0.65	-	0.07	**0.00**	2.97	1962-2012	15.07	-	-	-	0.14	0.06	**0.00**
Mozambique	2002-2012	78.05	-	4.67	-	-	-5.03	0.04	**0.00**	1.31	1982-2012	11.56	-	-	-	-	-	**0.00**
Namibia	2002-2012	-	-	-	-	-	-	-	**0.00**	4.17	1982-2012	24.63	-	-	0.69	-	-	**0.00**
Seychelles	2002-2012	-1.73	-0.47	-0.21	-	-	1.37	-	**-0.04**	4.12	1962-2012	3.97	-	0.83	-	-	0.07	**0.00**
South Africa	2002-2012	-	1.31	-0.33	-	-0.13	1.56	-	**0.19**	9.76	1973-2012	11.56	-	-	-	0.47	-	**0.00**
Swaziland	2002-2012	-	-	-	-	-	1.06	-	**0.00**	1.76	1972-2012	17.34	-	-	-	-	-	**0.00**
Tanzania	2002-2012	10.67	20.92	-	-	-	-	-0.30	**1.83**	1.23	1991-2012	-	-	-	-	0.88	-	**0.00**
Zambia	2002-2012	-	-	-6.20	-	0.83	-	-	**0.00**	1.23	1996-2012	-	-	-	-	0.81	-	**0.00**
Zimbabwe	2002-2012	-	-0.91	-	-	-	-	0.28	**-0.10**	1.27	1978-2012	-	-0.42	-	-0.74	-	0.13	**-0.16**
Ø									**0.11**									**-0.01**

Table A.21.: Phillips Curve estimates II: ECOWAS and SADC

Note: Coefficient estimated displayed are at least significant on a 10% level. Inflation measured as the annual rate of change of the deflator of total sales. Owing to lack of data, the inflation of Algeria, Cape Verde, the Central African Republic, Chad, Comoros, Djibouti, Ethiopia, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Libya, Mali, Niger, Nigeria, Malawi, Sao Tome and Principe, Seychelles, and Tunisia is measured as the annual rate of change of the GDP deflator.
Source: World Bank, own table and calculations.

	Hybrid Phillips Curve									Backward-looking Phillips Curve							
	sample period	constant	gap	gap_{t-1}	gap_{t-2}	π_{t-1}	$E(\pi_{t+1})$	Δ oil	contemp. Resp. rel. to av. Infl. (ρ)	VIF	sample period	constant	gap	gap_{t-1}	gap_{t-2}	π_{t-1}	Δ oil	contemp. Resp. rel. to av. Infl. (ρ)
	COMESA																	
Burundi	2002-2012	-	-	-	-	-	1.36	-	**0.00**	3.98	1998-2012	8.66	-	-	-	-	0.22	**0.00**
Comoros	2002-2012	3.20	-	1.06	-	-	-	-0.03	**0.00**	5.17	1982-2012	11.46	-	1.16	-	-	-	**0.00**
Congo (Dem. Rep.)	2002-2012	-	-	-	-	-	2.87	-	**0.00**	2.41	1962-2012	15.67	-	-	-	0.54	-	**0.00**
Djibouti	2002-2012	-	_	5.24	-	-	1.45	-	**0.00**	5.61	1991-2012	-	-	-	-	0.46	-	**0.00**
Egypt	2002-2012	-	_	-	-	-	-	-	**0.00**	2.15	1967-2012	-	-	-	-	0.19	-	**0.00**
Eritrea	2002-2011	15.25	-	-	-	-	-	-	**0.00**	1.74	1993-2011	43.89	-	-	-	-	-	**0.00**
Ethiopia	2002-2012	-156.08	-	-	-	-	-	-	**0.00**	1.93	1982-2012	-	-	-	-	-	-	**0.00**
Kenya	2002-2012	-	-	-	-	-	-	-	**0.00**	2.06	1962-2012	-	-0.54	0.79	-	0.22	0.06	**-0.06**
Libya	2002-2010	-	-	-	-	-	-	0.50	**0.00**	1.62	2000-2010	-	-2.95			0.26	0.53	**-0.26**
Madagascar	2002-2012	66.09	-	-	-1.42	-	-	-	**0.00**	1.95	1962-2012	3.15	-	-	-	0.60	-	**0.00**
Malawi	2002-2012	7.34	-3.08	-	-	-	0.52	-	**-0.19**	1.73	1962-2012	-8.21	-0.63	-	-	-	0.04	**-0.04**
Mauritius	2002-2012	-	-	-	-	0.65	-	0.07	**0.00**	2.97	1962-2012	15.07	-	-	-	0.14	0.06	**0.00**
Rwanda	2002-2012	8.99	-2.93	-	-	-	-	-	**-0.33**	1.25	1962-2012	5.88	-1.39	0.58	-0.39	-	0.05	**-0.39**
Seychelles	2002-2012	-1.73	-0.47	-0.21	-	-	1.37	-	**-0.04**	4.12	1962-2012	3.97	-	0.83	-	-	0.07	**0.00**
Sudan	2002-2012	-	-0.80	-	-	-	-	0.08	**-0.05**	5.67	1962-2012	4.69	-0.83	0.91	-	0.71	-	**-0.03**
Swaziland	2002-2012	-	-	-	-	-	1.06	-	**0.00**	1.76	1972-2012	17.34	-	-	-	-	-	**0.00**
Uganda	2002-2012	-	4.77	-	-	-	-	-0.15	**0.50**	2.20	1994-2012	-	3.68	-	-	-	-0.10	**0.47**
Zambia	2002-2012	-	-	-6.20	-	0.83	-	-	**0.00**	1.23	1996-2012	-	-	-	-	0.81	-	**0.00**
Zimbabwe	2002-2012	-	-0.91	-	-	-	-	0.28	**-0.10**	1.27	1978-2012	-	-0.42	-	-0.74	-	0.13	**-0.16**
ø									**-0.01**									**-0.02**
	CEN-SAD																	
Benin	2002-2012	-	-1.12	-	-	-	0.92	-	**-0.39**	3.57	1962-2012	1.18	-	-	-	0.57	-	**0.00**
Burkina Faso	2002-2012	-	-	-	-	-	1.02	-	**0.00**	2.93	1967-2012	1.47	_	0.78	0.60	0.50	-	**0.00**
Cape Verde	2002-2012	3.50	2.98	-	-	-0.55	-	-	**1.70**	3.18	1981-2012	30.36	-	-	-	-	-	**0.00**
Central African Republic	2002-2012	-	-0.91	-	-	-	0.77	-	**-0.45**	1.54	1962-2012	3.75	-	-	-0.65	-	-	**0.00**
Comoros	2002-2012	3.20	-	1.06	-	-	-	-0.03	**0.00**	5.17	1982-2012	11.46	-	1.16	-	-	-	**0.00**
Cote d'Ivore	2002-2012	-	-	-	-	-	1.29	-	**0.00**	1.21	1962-2012	2.81	-	-	-	0.11	-	**0.00**
Chad	2002-2012	-	0.48	-	-	0.21	-	0.20	**0.08**	1.34	1962-2012	5.50	-	-	-	-	-	**0.00**
Djibouti	2002-2012	-	_	5.24	-	-	1.45	-	**0.00**	5.61	1991-2012	-	-	-	-	0.46	-	**0.00**
Egypt	2002-2012	-	_	-	-	-	-	-	**0.00**	2.15	1967-2012	-	-	-	-	0.19	-	**0.00**
Eritrea	2002-2011	15.25	-	-	-	-	-	-	**0.00**	1.74	1993-2011	43.89	-	-	-	-	-	**0.00**
Gambia	2002-2012	9.23	-	-	-	-	1.45	-	**0.00**	1.89	1986-2012	7.33	-	-	-1.40	-	-	**0.00**
Ghana	2002-2012	29.57	-	-	0.76	-	0.85	-	**0.00**	1.10	1962-2012	63.08	-	-	-	-	-	**0.00**
Guinea	2002-2012	-	-	-	-	-	1.51	-	**0.00**	9.92	1988-2012	-	-	-	-	0.98	0.09	**0.00**

Table A.22.: Phillips Curve estimates III: COMESA and CEN-SAD

Note: Coefficient estimated displayed are at least significant on a 10% level. Inflation measured as the annual rate of change of the deflator of total sales. Owing to lack of data, the inflation of Algeria, Cape Verde, the Central African Republic, Chad, Comoros, Djibouti, Ethiopia, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Libya, Mali, Niger, Nigeria, Malawi, Sao Tome and Principe, Seychelles, and Tunisia is measured as the annual rate of change of the GDP deflator.
Source: World Bank, own table and calculations.

	Hybrid Phillips Curve									Backward-looking Phillips Curve							
	sample period	constant	gap	gap_{t-1}	gap_{t-2}	π_{t-1}	$E(\pi_{t+1})$	Δ oil	contemp. Resp. rel. to av. Infl. (ρ)	VIF	sample period	constant	gap	gap_{t-1}	gap_{t-2}	π_{t-1}	Δ oil	contemp. Resp. rel. to av. Infl. (ρ)
	CEN-SAD																	
Guinea-Bissau	2002-2012	-	3.65	-1.09	-	-	-	0.07	**1.53**	1.44	1998-2012	3.82	-	-	-	-	-	**0.00**
Kenya	2002-2012	-	-	-	-	-	-	-	**0.00**	2.06	1962-2012	-	-0.54	0.79	-	0.22	0.06	**-0.06**
Liberia	2002-2012	7.02	-	-	-	-	-	-	**0.00**	21.23	1962-2012	-	-	-0.10	-	-	0.09	**0.00**
Libya	2002-2010	-	-	-	-	-	-	0.50	**0.00**	1.62	2000-2010	-	-2.95			0.26	0.53	**-0.26**
Mali	2002-2012	-	-	-	-	-	-	-	**0.00**	1.83	1969-2012	-	-	0.37	-	-	-	**0.00**
Mauritania	2002-2012	5.69	-	-	-	-	-	0.18	**0.00**	6.31	1962-2012	-	-	-	-	-	-	**0.00**
Morocco	2002-2012	-	-	-	-	0.32	-	0.09	**0.00**	2.05	1961-2012	3.52	-	-	-	0.30	0.10	**0.00**
Niger	2002-2012	-	-	-	-	-	1.80	-	**0.00**	3.70	1962-2012	2.27	-	0.21	-	-	-	**0.00**
Nigeria	2002-2012	-	-	-	-	-	1.28	-	**0.00**	3.35	1962-2012	-10.54	-	-	-	-	0.17	**0.00**
Sao Tome and Principe	2002-2012	-	-	-	-	-	0.35	-	**0.00**	2.50	2002-2012	8.25	-	-2.02	-	0.28	-	**0.00**
Senegal	2002-2012	-	-	-	-	-	-	0.14	**0.00**	1.51	1962-2012	-	-	-	-	0.76	0.08	**0.00**
Sierra Leone	2002-2012	-	-	0.36	-	-0.18	-	0.14	**0.00**	1.79	1969-2012	-	-	-	-1.67	0.96	-	**0.00**
Sudan	2002-2012	-	-0.80	-	-	-	-	0.08	**-0.05**	5.67	1962-2012	4.69	-0.83	0.91	-	0.71	-	**-0.03**
Togo	2002-2012	-	-	-	-	-	-	0.20	**0.00**	1.25	1962-2012	2.32	-	0.33	-	0.13	0.09	**0.00**
Tunisia	2002-2012	-	-	-	-	-	0.62	0.03	**0.00**	1.42	1967-2012	3.08	-0.28	0.42	-	0.47	0.04	**-0.13**
ø									**0.09**									**-0.02**
	Other																	
European Monetary Union	1996-2014	-	0.12	-	-0.12	-	0.75	0.02	**0.08**	16.79	1996-2014	1.14	0.38	-	-	-	0.02	**0.24**
Germany	1985-2014	-	0.17	-	-	-	0.75	-	**0.12**	2.77	1987-2014	-	0.13	-	-	0.70	0.01	**0.09**
USA	1985-2012	-	-	-	-	0.31	0.49	0.04	**0.00**	4.19	1985-2014	1.80	0.27	-0.23	-	0.42	0.03	**0.12**

Table A.23.: Phillips Curve estimates IV: CEN-SAD (continued)

Note: Coefficient estimated displayed are at least significant on a 10% level. Inflation measured as the annual rate of change of the deflator of total sales. Owing to lack of data, the inflation of Algeria, Cape Verde, the Central African Republic, Chad, Comoros, Djibouti, Ethiopia, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Libya, Mali, Niger, Nigeria, Malawi, Sao Tome and Principe, Seychelles, and Tunisia is measured as the annual rate of change of the GDP deflator.
Source: World Bank, own table and calculations.

	1990-2000			2000-2010		
	Cyclical Difference	Net migration	Contribution	Cyclical Difference	Net migration	Contribution
	UMA					
Algeria	-4.49	-1820	✓	0.12	-2041	X
Libya	13.15	-3608	X	-0.79	-279	✓
Mauritania	-1.82	-126	✓	-1.58	-2605	✓
Morocco	-4.49	3490	X	0.33	2425	✓
Tunisia	-0.28	2064	X	5.48	2500	✓
Ø	0.41	-	40%	0.71	-	80%
	EAC					
Burundi	-1.53	548556	X	-0.64	-499371	✓
Rwanda	-29.17	-290973	✓	1.07	-77268	X
Tanzania	0.65	-475753	X	1.28	550187	✓
Kenya	-0.24	-307269	✓	-0.97	49896	X
Uganda	-0.31	525439	X	-0.10	-23444	✓
Ø	-6.12	-	40%	0.13	-	60%
	ECCAS					
Angola	10.31	-185271	X	2.11	-138457	X
Burundi	0.71	14553	✓	-1.08	-111470	✓
Cameroon	-4.14	31844	X	1.99	-9327	X
Central African Republic	1.28	-169	X	-1.66	40398	X
Chad	0.76	-13416	X	-10.81	-9647	✓
Congo (Rep.)	1.85	-134616	X	2.93	-84059	X
Congo (Dem. Rep.)	0.75	300781	✓	2.54	336790	✓
Equatorial Guinea	-18.77	17339	X	5.21	28894	✓
Gabon	8.76	-34271	X	-8.67	-58557	✓
Sao Tome & Principe	1.52	3226	✓	-1.14	5435	X
Ø	0.30	-	30%	-0.86	-	50%
	IGAD					
Djibouti	6.16	3944	✓	-1.67	-873	✓
Eritrea	3.53	304074	✓	-8.07	-277141	✓
Ethiopia	-0.96	-715718	✓	-0.91	-47682	✓
Kenya	3.46	-288258	X	-3.54	39432	X
Sudan	-3.72	485116	X	2.97	346035	✓
Uganda	2.19	210842	✓	-2.98	-59771	✓
Ø	1.78	-	67%	-2.37	-	83%

Table A.24.: Cyclical differences and net migration I: UMA, EAC, ECCAS, and IGAD

Note: Cyclical differences are calculated as the sum of yearly deviations in output gaps in percent between the respective country and the remaining REC. Net migration in persons. Somalia, South Sudan, and Western Sahara are excluded from calculations owing to insufficient data.
Source: World Bank, United Nations, own table and calculations.

	1990-2000			2000-2010		
	Cyclical Difference	Net migration	Contribution	Cyclical Difference	Net migration	Contribution
COMESA						
Burundi	-3.27	183711	X	-2.683006348	-93469	✓
Comoros	-4.58	1937	X	-2.125073857	1479	X
Congo (Dem. Rep.)	-4.02	125538	X	-0.297135711	161133	X
Djibouti	2.06	4331	✓	-2.789294854	-368	✓
Egypt	-2.38	17209	X	0.48063922	-11533	X
Eritrea	1.42	302811	✓	-9.241760121	-277036	✓
Ethiopia	-4.67	-716335	✓	-1.903965872	-46999	✓
Kenya	-1.98	-288368	✓	-3.956214986	29350	X
Libya	13.06	20598	✓	-2.007123601	-5511	✓
Madagascar	-1.32	2265	X	-0.345573506	585	X
Malawi	5.52	-34542	X	-5.059348035	-22160	✓
Mauritius	-2.51	-1111	✓	-0.45855883	-252	✓
Rwanda	-30.68	-500576	✓	-2.613665923	13442	X
Seychelles	4.21	-1039	X	-3.125612729	-177	✓
Sudan	-7.22	446228	X	-0.64731237	336493	X
Swaziland	5.67	-376	X	-0.850044751	-71	✓
Uganda	-2.27	443155	X	-3.749618186	-135700	✓
Zambia	-4.99	46388	X	-3.927192539	39739	X
Zimbabwe	-0.74	-51824	✓	-11.29066485	11055	X
Ø	-2.04	-	42%	-2.98	-	53%
CEN-SAD						
Benin	-2.56	12280	X	0.53	14318	✓
Burkina Faso	-4.37	220205	X	-3.44	-1791	✓
Cape Verde	-5.86	-1590	✓	1.57	-1998	X
Central African Republic	-3.50	-2642	✓	-2.99	41255	X
Comoros	-4.67	2428	X	-0.28	1618	X
Cote d'Ivore	-1.63	-289987	✓	-1.48	166466	X
Chad	-4.01	-111039	✓	-11.88	-101870	✓
Djibouti	1.97	387	✓	-0.94	505	X
Egypt	-2.04	24448	X	3.00	-8168	X
Eritrea	1.60	366533	✓	-7.37	-278760	✓
Gambia	-2.60	-72014	✓	5.41	19610	✓
Ghana	-3.41	-8248	✓	-6.66	-94708	✓
Guinea	-3.56	-451905	✓	-1.67	341952	X

Table A.25.: Cyclical differences and net migration II: ECOWAS and SADC

Note: Cyclical differences are calculated as the sum of yearly deviations in output gaps in percent between the respective country and the remaining REC. Net migration in persons. Somalia, South Sudan, and Western Sahara are excluded from calculations owing to insufficient data.
Source: World Bank, United Nations, own table and calculations.

	1990-2000			2000-2010		
	Cyclical Difference	Net migration	Contribution	Cyclical Difference	Net migration	Contribution
COMESA						
Burundi	-3.27	183711	X	-2.683006348	-93469	✓
Comoros	-4.58	1937	X	-2.125073857	1479	X
Congo (Dem. Rep.)	-4.02	125538	X	-0.297135711	161133	X
Djibouti	2.06	4331	✓	-2.789294854	-368	✓
Egypt	-2.38	17209	X	0.48063922	-11533	X
Eritrea	1.42	302811	✓	-9.241760121	-277036	✓
Ethiopia	-4.67	-716335	✓	-1.903965872	-46999	✓
Kenya	-1.98	-288368	✓	-3.956214986	29350	X
Libya	13.06	20598	✓	-2.007123601	-5511	✓
Madagascar	-1.32	2265	X	-0.345573506	585	X
Malawi	5.52	-34542	X	-5.059348035	-22160	✓
Mauritius	-2.51	-1111	✓	-0.45855883	-252	✓
Rwanda	-30.68	-500576	✓	-2.613665923	13442	X
Seychelles	4.21	-1039	X	-3.125612729	-177	✓
Sudan	-7.22	446228	X	-0.64731237	336493	X
Swaziland	5.67	-376	X	-0.850044751	-71	✓
Uganda	-2.27	443155	X	-3.749618186	-135700	✓
Zambia	-4.99	46388	X	-3.927192539	39739	X
Zimbabwe	-0.74	-51824	✓	-11.29066485	11055	X
Ø	-2.04	-	42%	-2.98	-	53%
CEN-SAD						
Benin	-2.56	12280	X	0.53	14318	✓
Burkina Faso	-4.37	220205	X	-3.44	-1791	✓
Cape Verde	-5.86	-1590	✓	1.57	-1998	X
Central African Republic	-3.50	-2642	✓	-2.99	41255	X
Comoros	-4.67	2428	X	-0.28	1618	X
Cote d'Ivore	-1.63	-289987	✓	-1.48	166466	X
Chad	-4.01	-111039	✓	-11.88	-101870	✓
Djibouti	1.97	387	✓	-0.94	505	X
Egypt	-2.04	24448	X	3.00	-8168	X
Eritrea	1.60	366533	✓	-7.37	-278760	✓
Gambia	-2.60	-72014	✓	5.41	19610	✓
Ghana	-3.41	-8248	✓	-6.66	-94708	✓
Guinea	-3.56	-451905	✓	-1.67	341952	X

Table A.26.: Cyclical differences and net migration III: COMESA and CEN-SAD

Note: Cyclical differences are calculated as the sum of yearly deviations in output gaps in percent between the respective country and the remaining REC. Net migration in persons. Somalia, South Sudan, and Western Sahara are excluded from calculations owing to insufficient data.
Source: World Bank, United Nations, own table and calculations.

	1990-2000			2000-2010		
	Cyclical Difference	Net migration	Contribution	Cyclical Difference	Net migration	Contribution
	CEN-SAD					
Guinea-Bissau	-6.61	-18	✓	0.52	3393	✓
Kenya	-2.01	-11887	✓	-2.13	1360	X
Liberia	-48.45	-100649	✓	10.64	-48362	X
Libya	11.74	18500	✓	-0.84	-9596	✓
Mali	-6.31	63830	X	1.23	-35403	X
Mauritania	-2.02	5498	X	-3.05	-22419	✓
Morocco	-4.15	2204	X	-1.64	1825	X
Niger	-5.23	53020	X	-2.44	41782	X
Nigeria	3.41	-165984	X	-3.67	-234763	✓
Sao Tome and Principe	-3.20	1224	X	-2.49	-2524	✓
Senegal	-4.20	52626	X	-0.18	8287	X
Sierra Leone	1.38	604329	✓	-2.55	-291898	✓
Sudan	-7.10	-266595	✓	1.18	380363	✓
Togo	0.01	53591	✓	-6.43	107662	X
Tunisia	-0.46	1455	X	3.86	1864	✓
ø	-3.85	-	57%	-1.22	-	50%

Table A.27.: Cyclical differences and net migration IV: CEN-SAD (continued)

Note: Cyclical differences are calculated as the sum of yearly deviations in output gaps in percent between the respective country and the remaining REC. Net migration in persons. Somalia, South Sudan, and Western Sahara are excluded from calculations owing to insufficient data.
Source: World Bank, United Nations, own table and calculations.

Country/REC		Recommended REC	Trade with remaining REC in percent of GDP	Output gap correlation post 1994 (p-value of Q-test)
Angola	ECCAS		0.04	0.08 (0.71)
	SADC	✓	2.49	0.68 (0.00)
Benin	CEN-SAD	✓	9.10	-0.23 (0.31)
	ECOWAS		8.51	-0.19 (0.39)
Burkina Faso	CEN-SAD	✓	8.08	0.54 (0.02)
	ECOWAS		7.59	0.53 (0.02)
Burundi	COMESA	✓	6.33	-0.28 (0.22)
	EAC		4.82	-0.16 (0.47)
	ECCAS		0.10	-0.11 (0.61)
Cape Verde	CEN-SAD	✓	0.93	0.05 (0.82)
	ECOWAS		0.53	-0.41 (0.06)
Central African Republic	CEN-SAD		1.59	-0.25 (0.28)
	ECCAS	✓	3.67	0.24 (0.26)
Chad	CEN-SAD		1.25	0.05 (0.82)
	ECCAS	✓	1.66	-0.14 (0.52)
Comoros	CEN-SAD		2.36	-0.32 (0.17)
	COMESA	✓	3.77	-0.17 (0.47)
Congo (Dem. Rep.)	COMESA		16.68	-0.37 (0.10)
	ECCAS		0.51	-0.11 (0.61)
	SADC	✓	21.37	-0.22 (0.32)
Cote d'Ivore	CEN-SAD	✓	18.35	0.43 (0.06)
	ECOWAS		16.93	0.18 (0.42)
Djibouti	CEN-SAD	✓	44.11	0.13 (0.58)
	COMESA		11.00	0.11 (0.63)
	IGAD		33.41	0.14 (0.53)
Egypt	CEN-SAD		1.30	0.01 (0.97)
	COMESA	✓	1.04	0.42 (0.06)
Eritrea	CEN-SAD	✓	-	-0.23 (0.32)
	COMESA		-	-0.43 (0.06)
	IGAD	✓	-	-0.20 (0.36)
Ethiopia	COMESA	✓	1.59	0.37 (0.10)
	IGAD		1.31	0.35 (0.11)

Table A.28.: Multiple REC memberships: Trade and synchronicity comparison

Note: REC recommendation based on trade in percent of GDP and output gap correlation and marked with a green tick (more than one tick per country suggests indecision). If both criteria do not suggest the same REC, the recommendation is based on trade if correlation coefficients are insignificant. Trade data of Eritrea and Swaziland not available.
Source: World Bank, International Monetary Fund, own table and calculations.

Country/REC		Recommended REC	Trade with remaining REC in percent of GDP	Output gap correlation post 1994 (p-value of Q-test)
Gambia	CEN-SAD	✓	17.70	0.27 (0.25)
	ECOWAS		14.16	0.22 (0.32)
Ghana	CEN-SAD	✓	8.11	0.06 (0.78)
	ECOWAS		7.51	0.23 (0.29)
Guinea	CEN-SAD	✓	6.61	-0.19 (0.41)
	ECOWAS		4.68	-0.13 (0.56)
Guinea-Bissau	CEN-SAD	✓	13.76	-0.08 (0.74)
	ECOWAS		12.43	-0.05 (0.82)
Kenya	CEN-SAD		2.76	0.43 (0.06)
	COMESA	✓	7.48	0.51 (0.03)
	EAC		5.49	0.38 (0.08)
	IGAD		3.08	0.46 (0.03)
Liberia	CEN-SAD	✓	23.61	0.00 (0.99)
	ECOWAS		16.94	-0.12 (0.59)
Libya	CEN-SAD	✓	3.88	0.51 (0.03)
	COMESA		2.11	0.15 (0.50)
	UMA		2.44	0.27 (0.24)
Madagascar	COMESA	✓	2.19	0.58 (0.01)
	SADC	✓	4.36	0.33 (0.13)
Malawi	COMESA	✓	7.01	0.40 (0.08)
	SADC	✓	16.13	0.19 (0.39)
Mali	CEN-SAD	✓	8.47	-0.03 (0.88)
	ECOWAS		7.55	-0.18 (0.41)
Mauritania	CEN-SAD	✓	12.33	0.31 (0.17)
	UMA		3.37	0.30 (0.19)
Mauritius	COMESA		3.14	0.31 (0.18)
	SADC	✓	7.33	0.06 (0.78)
Morocco	CEN-SAD	✓	2.07	0.01 (0.98)
	UMA		1.83	0.04 (0.85)
Niger	CEN-SAD	✓	9.75	0.09 (0.68)
	ECOWAS		5.74	-0.07 (0.73)

Table A.29.: Multiple REC memberships: Trade and synchronicity comparison (continued)

Note: REC recommendation based on trade in percent of GDP and output gap correlation and marked with a green tick (more than one tick per country suggests indecision). If both criteria do not suggest the same REC, the recommendation is based on trade if correlation coefficients are insignificant. Trade data of Eritrea and Swaziland not available.
Source: World Bank, International Monetary Fund, own table and calculations.

Country/REC		Recommended REC	Trade with remaining REC in percent of GDP	Output gap correlation post 1994 (p-value of Q-test)
Nigeria	CEN-SAD	✓	2.38	0.33 (0.15)
	ECOWAS		2.14	0.21 (0.33)
Rwanda	COMESA		11.80	0.29 (0.21)
	EAC	✓	10.78	0.55 (0.01)
Sao Tome & Principe	CEN-SAD		0.38	0.12 (0.61)
	ECCAS	✓	2.77	-0.17 (0.45)
Senegal	CEN-SAD	✓	12.25	0.39 (0.09)
	ECOWAS	✓	10.85	0.48 (0.03)
Seychelles	COMESA		6.95	0.55 (0.02)
	SADC	✓	10.88	0.48 (0.03)
Sierra Leone	CEN-SAD	✓	4.44	-0.14 (0.54)
	ECOWAS		3.90	0.01 (0.98)
Somalia	CEN-SAD	✓	-	- -
	IGAD	✓	-	- -
Sudan	CEN-SAD		1.16	0.36 (0.12)
	COMESA	✓	1.68	0.61 (0.01)
	IGAD		0.71	0.17 (0.43)
Swaziland	COMESA	✓	-	0.81 (0.00)
	SADC		-	0.42 (0.05)
Tanzania	EAC	✓	3.61	0.53 (0.02)
	SADC	✓	4.64	0.38 (0.09)
Togo	CEN-SAD	✓	15.87	0.54 (0.02)
	ECOWAS	✓	15.38	0.67 (0.00)
Tunisia	CEN-SAD	✓	3.48	0.71 (0.00)
	UMA		3.58	0.27 (0.24)
Uganda	COMESA		7.53	0.27 (0.24)
	EAC	✓	7.01	0.43 (0.05)
	IGAD	✓	5.25	0.48 (0.03)
Zambia	COMESA	✓	13.59	0.40 (0.08)
	SADC	✓	28.04	0.26 (0.23)
Zimbabwe	COMESA		7.87	-0.10 (0.66)
	SADC	✓	45.44	-0.05 (0.83)

Table A.30.: Multiple REC memberships: Trade and synchronicity comparison (continued)

Note: REC recommendation based on trade in percent of GDP and output gap correlation and marked with a green tick (more than one tick per country suggests indecision). If both criteria do not suggest the same REC, the recommendation is based on trade if correlation coefficients are insignificant. Trade data of Eritrea and Swaziland not available.
Source: World Bank, International Monetary Fund, own table and calculations.

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Affidavit

Ich erkläre hiermit, dass ich die vorliegende Arbeit ohne unzulässige Hilfe Dritter und ohne Benutzung anderer als der angegebenen Hilfsmittel angefertigt habe; die aus fremden Quellen direkt oder indirekt übernommenen Gedanken sind als solche kenntlich gemacht.

Die Arbeit wurde bisher weder im Inland noch im Ausland in gleicher oder ähnlicher Form einer Prüfungsbehörde zur Erlangung eines akademischen Grades vorgelegt.

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