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Costs and benefits of using the Rand as common currency in southern Africa

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Abstract: Do monetary unions between developing economies support sustainable economic development for the members? Previous research has only considered traditional research methods to examine costs and benefits of monetary unions in developing regions. This thesis applies new measures to determine how the operation of institutions encounters specific problems of developing economies for the case of the Common Monetary Area in southern Africa. Additionally, this thesis investigates costs from asymmetric economic shocks and benefits from intensified trade between the members and their evolution over time. The common component of economic shocks in Namibia, Lesotho, and Swaziland with South African economic fluctuations is measured using the variance decomposition of forecast errors in a structural VAR model. Shocks are found to hit the CMA area asymmetrically which has not changed since 1960. The analysis of bilateral trade data since 2000 shows no common currency trade-enhancing effect between the CMA members compared to trade with other economies in the region. Costs for the small members arise from the asymmetric institutional design and the South African Reserve Bank's bias towards the South African economy when setting monetary policy for the area. Benefits occur due to the adopted credible low-inflation reputation of the SARB, the disciplining effect on the state budget and lower interest on state debt. Moreover, the small CMA members profit from the opportunity of taking on debt in their domestic currency. The analysis demonstrates that further research on monetary unions will need to consider new aspects of costs and benefits that address the particular situation of developing economies.

Keywords: monetary union, Rand, Common Monetary Area, South African Reserve Bank, Taylor Rule

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List of Abbreviations

ACR	Autocorrelogram
ADF Test	Augmented Dickey-Fuller Test
AR	Autoregressive
CMA	Common Monetary Area
ECB	European Central Bank
OCA	Optimum Currency Area
PP Test	Phillips-Perron Test
SACU	Southern African Customs Union
SADC	Southern African Development Community
SARB	Southern African Reserve Bank
VAR	Vector Autoregressive

1 Introduction

This thesis evaluates the costs and benefits of the Common Monetary Area (CMA) in southern Africa, a monetary agreement between South Africa, Lesotho, Swaziland, and Namibia. In doing so, the thesis considers how the collective use of the Rand contributes to or impedes the economic development of specifically the smaller member economies. For this particular purpose, the evolution of net gains from deeper economic and monetary integration is tracked over time by examining the symmetry of economic shocks and trade intensiveness between the members. Moreover, this thesis takes on a new perspective to investigate gains and losses of developing economies in currency unions. It also aims to evaluate whether the small members benefit or lose from the asymmetric power structure in the CMA.

Initiatives for monetary arrangements are spreading across different regions. Developing regions push towards monetary unification since integration with neighbouring economies is both seen as complement to a sustainable development path and as a way to unite and gain power in the global economy. On the African continent, some monetary agreements have been existing for a long time but, in recent years, new initiatives are being pursued in other regions (De Grauwe, 2018:97-98).

The CMA agreement has not aroused strong academic interest compared to other African monetary unions. Additionally, the literature written has been limited to the investigation on the symmetry of economic shocks that hit the region. Most studies found that economic shocks have been occurring rather asymmetrically in southern Africa pointing toward the unsuitability of using a common currency of the member economies. Furthermore, studies have checked if the CMA complies with the Optimum Currency Area (OCA) criteria and it was observed that the arrangement partially satisfies the criteria that mitigate the negative consequences of asymmetric shocks. However, predominantly traditional measures of costs and benefits of monetary union have been applied and the question of whether the gains from monetary and economic integration have grown over time in the CMA has not been discussed.

The monetary agreement in southern Africa is an especially compelling case since it has persisted the longest around the globe compared to any other monetary arrangement between economies. Although at first not formulated in official terms and with a changing composition of member states, the agreement has proven to be politically and economically stable enough to endure for more than 100 years. This setting provides a good case for investigating how net gains have evolved over time. Another interesting feature is the asymmetric power structure of the CMA agreement; this is mainly due to South Africa’s strong economic, political and institutional dominance over the smaller member economies.

While Namibia has joined South Africa in the category of upper middle-income countries, inequality and poverty remain high in both economies; and Lesotho and Swaziland are still classified as lower middle-income countries. The preamble of the CMA treaty determines that the agreement should foster the economic development of the area and encourage progress in the less developed economies (Masha et al., 2007). Analysing advantages and disadvantages of a monetary union among developing economies poses different challenges and shifts the focus of research. However, the specificities of monetary unions between developing economies have only been discussed in few contributions (Kronberger, 2002; Fritz & Muhlich, 2010). Findings from extensive research about the Eurozone, a currency union among industrialized economies, may only partially apply to the CMA and other southern monetary arrangements between developing economies, which is due to a different institutional setting and economic situation of its member economies. These considerations lead to several questions. Have South Africa, Namibia, Lesotho, and Swaziland integrated further and supported each other over the last 100 years? Can South Africa lead the way on a sustainable development path for the smaller member economies by providing a stable macroeconomic environment and a currency into that investors are eager to invest? Or does the large economy suppress its neighbours' development by dominating monetary policy setting and attracting all investment funds? Does the CMA in its current mode of operation support further economic development or impede it?

This thesis sets out to answer those questions by evaluating the costs and benefits that arise from the use of the Rand for the small CMA members. It uses traditional measures of costs and benefits to answer the endogeneity question; the evolution of those characteristics is tracked over time. Moreover, this thesis investigates aspects of costs and benefits that matter particularly for developing economies in monetary unions and have been neglected in previous research.

Costs arising from asymmetric shocks are measured by determining how large the part of common regional shocks with South Africa and the individual domestic shocks to the Namibian, Basotho, and Swazi economies are and how this has changed over time since 1960. Profits from monetary unification due to enhanced trade between the members are measured by comparing trade relations of the CMA members with other neighbouring economies in southern Africa. The perspective of developing economies and the asymmetric power structure of the CMA agreement are considered by discussing how specific problems such as high inflation and original sin are encountered when small economies participate in a monetary union with a slightly further developed larger economy, such as South Africa. Moreover, a test is conducted on whether the South African Reserve Bank (SARB) considers the welfare of the other member economies when setting the monetary policy for the CMA area.

This thesis finds high costs for the small CMA members originating from asymmetric shocks, using established econometric methodology. Fluctuations of the South African economy explain only a minor portion of economic shocks to Namibian, Basotho, and Swazi output, and the common component in shocks has not grown since 1960. Additionally, this thesis finds low gains arising from intra-CMA trade, using descriptive statistics; trade is not as

intensive as expected. No common currency trade-enhancing effect is found between the CMA members when compared to trading relations with other neighbouring economies outside of the CMA. A strong bias of the SARB's monetary policy towards the South African economy is found which leaves the small members' economies unbalanced after asymmetric shocks. However, income convergence inside the CMA is not found to be severely affected. Benefits for the small member economies originating from the high credibility of the anti-inflationary policy by the SARB and from the opportunity of borrowing in the domestic currency are discussed.

The results indicate the need for further research on monetary unions between developing economies. Specifically, traditional OCA and monetary unions research neglect relevant benefits and costs that occur for developing economies participating in a currency union; this causes a noncomprehensive evaluation of the net gains. Additional focus will have to be given on those aspects to determine correctly how participating in a monetary union may further or impede the development of economies.

The remainder of the thesis starts with section 2 providing a theoretical discussion of the costs and benefits of participating in a monetary union while considering the OCA Theory and the endogeneity question. Furthermore, gains and losses of monetary unification that specifically concern developing economies are reviewed. Section 3 gives an overview of the institutional design and history of the CMA agreement and discusses previous research on the CMA. Section 4 addresses the econometric analysis of the symmetry of shocks and the descriptive analysis of intra-CMA trade. The operation of fiscal and monetary institutions, their effects inside the monetary union and their implications for the small CMA members are examined in section 5. Ultimately, the last section concludes the thesis.

2 Costs and benefits of monetary union

This section sets out to theoretically discuss costs and benefits arising from monetary unification. Moreover, the OCA Theory and the connected research on the endogeneity question are reviewed. The section closes by surveying the literature on monetary unions between developing economies and how research on this topic may differ from traditional OCA and monetary unions research.

In general, benefits from monetary union originate from decreased transaction costs since currencies must not be exchanged against each other. Consequently, trade between the member economies of a monetary union is assumed to increase and market access is opened to a larger regional market. The removal of the exchange rate volatility is expected to boost investors' confidence to invest across national borders in the monetary union which leads to further financial integration. The commitment of a common central bank to conduct a low-inflation monetary policy appears more credible since fiscal and monetary authorities have less influence on each other. This setup is presumed to limit monetary expansion and excessive state budget deficits. Moreover, it is supposed to lower government bond yields due to more discipline and confidence in the institutional framework. Assets inside the monetary union are assumed to increase in value due to reduced currency risk. Furthermore, lower costs arise from operating the monetary system due to economies of scale. To sum up, joining a monetary union may contribute to a more stable macroeconomic environment and higher economic growth.

On the other hand, costs for the members of a monetary union emerge from sacrificing the independent exchange rate and monetary policy as instruments to balance economic shocks. When using a common currency, individual member economies cannot devaluate on their own and are not able to expand the quantity of money in the national economy unilaterally. These costs are immense when economic shocks hit a currency area asymmetrically. If some economies are in a boom phase, while others are in a recession, the common central bank cannot accommodate the different situations by setting one monetary policy for the whole area. Shocks hit asymmetrically when the production structures of the member economies differ enormously (Feldstein, 2012; De Grauwe, 2013b). Then, exchange rate adjustments may be necessary, but this instrument is not available with a common currency or irrevocably pegged exchange rates (Krugman, 2013). Even if shocks of the members of a currency union align, transmission mechanisms of monetary policy can work out differently (Nindi, 2012). Additionally, the political economy branch discusses that economies may have different growth models that require different monetary policies (Hall, 2014; Scharpf, 2011).

Another drawback of participating in a currency union is that countries forgo seigniorage revenues. Moreover, some thriving economies fear to lose credibility when affiliated with less

fortune economies. They worry that mechanisms, such as moral hazard or adverse selection, operate to their disadvantage. In summary, depending on how synchronized and similar the member economies are, the stable macroeconomic environment may be jeopardized to a greater or lesser extent.

2.1 Optimum Currency Area Theory

The OCA Theory identifies criteria which can mitigate the costs of asymmetric shocks in a monetary union. The extent to which members of a monetary union comply with the criteria determines the degree to which negative consequences of asymmetric shocks can be cushioned. Mundell (1961) was the first to note that high labour mobility could reduce the costs regarding unemployment. An alternative to competitive devaluation could be that unemployed workers from regions in recession move to booming regions in demand of labour. McKinnon (1988) added that a high degree of capital mobility could mitigate the costs through the same mechanism. Moreover, highly integrated financial markets of the member economies would provide insurance across national borders. McKinnon (1963) made another crucial contribution when he identified that a high degree of openness to trade would limit an economy's ability to use the exchange rate as a balancing instrument; so, the costs of giving up a flexible exchange rate would be low. A competitive devaluation of the exchange rate is not effective if an economy imports large amounts of products and services relative to the size of GDP due to the exchange rate pass-through which comes into effect. Since import prices increase relatively after the devaluation of the nominal exchange rate and imports make up a large part of the domestic economy, the real exchange rate will not change considerably, and the domestic price level will not become substantially cheaper and boost exports.

Kenen (1969) argued that with similar and diversified economic structures, business cycles of the member economies would synchronize such that shocks would not hit individually but in the whole currency area simultaneously. In such a scenario, a common central bank could accommodate all member economies with the same monetary policy. Contrarily, Schelkle (2017) argues that diversity and different vulnerabilities to shocks in a monetary union are a form of risk diversification. Booming economies can compensate stumbling economies via cross-border trade and asset holding. Another kind of insurance among members are temporary fiscal transfers from booming economies to economies in recession as a further measure to control the costs of asymmetric shocks (De Grauwe, 2007). Prospering economies could control their inflationary boom, while economies in recession could start stimulating investment programs.

The Euro convergence criteria were set up to determine whether an economy is prepared to join the Eurozone. The Maastricht Treaty (EC Community, 1992) dictates to maintain low and similar inflation rates and government bond yields and to keep the state budget deficit below 3% and the debt-to-GDP ratio below 60%. In the literature, those criteria have been

included in the test of the optimality of currency areas with the reasoning that they should be followed by all members in any monetary union to avoid the build-up of imbalances between the economies. However, since the debt crisis hit the Eurozone in 2009, a discussion has emerged about whether the Maastricht criteria are reasonable and vital for a sustainable monetary union. Johansson and Ljungberg (2013) question the causal link between fiscal deficits and the outbreak of the crisis. De Grauwe (2013a) argues that the Stability and Growth Pact did not prevent the debt crisis from happening since design flaws were built into the institutional set-up of the Eurozone from the beginning. When the accumulated debt bubbles in the private sector crashed, the European Central Bank (ECB) did not function as a Lender of the Last Resort and the national governments could not provide solvency either since they were committed to a small deficit and debt-to-GDP ratio.

2.2 Endogeneity of monetary union

A new strand of literature treats the question whether the optimality of currency areas is endogenous in the sense that the costs of membership decrease with further integration of a monetary union. With removed exchange rate uncertainty and decreased transaction costs, trade between the economies in a monetary union is assumed to increase. One view argues that the increased trade relations tend to synchronize the economies' business cycles due to increased intra-industry trade (Frankel & Rose, 1998; EC Commission, 1990; De Grauwe & Mongelli, 2005). Economies integrate economically and financially when they share a common currency which renders production structures more alike. Mainly similar products and services in the same industries are exchanged between the national economies. Another perspective reasons that through increased economic integration regions specialize according to their comparative advantage so that industrial activities become concentrated in clusters which spread over different regions (Eichengreen, 1992; Krugman, 2001). Economies engage in inter-industry trade which means that they exchange products and services from different industries among each other. This mechanism makes individual economies more prone to get hit by asymmetric shocks.

2.3 Monetary union among developing economies

Developing and emerging economies face a different trade-off to join or remain outside of monetary unions. In the past, research has focused on the prototype of a monetary union between industrialized economies, the Eurozone. However, it is not straightforward that all findings can be transferred to monetary agreements in developing regions. The theory used, and methods applied on the Eurozone may differ from how research on monetary unions in Africa or Latin America should be designed. Masson and Pattillo (2004) identify that benefits of monetary union in Africa go beyond what is identified by the OCA Theory, but Kronberger (2002) notes that they are more difficult to gather. African governments believe that unifying

their monetary policies does not only build a stable macroeconomic environment but also stimulates economic activity that creates sustainable development (Maruping, 2005). Fritz and Muhlich (2010) regard the current OCA framework as unsatisfactory for the analysis of benefits and costs of monetary union in developing regions. Since southern monetary cooperation differs fundamentally from northern monetary arrangements, an adequate framework remains to be developed which considers the influence of monetary cooperation and integration on macroeconomic stabilisation in developing regions. Those shortcomings of the traditional approach also manifest due to a different structural context among developing economies (Robson, 1993). On the African continent, intra-regional trade is relatively low while external dependency is high. Exports consist primarily of mineral and agricultural products. Due to low levels of development and resource endowments, specialization and intra- and inter-industry trade are low (Nindi, 2012). Also, greater economic and political disparities exist between the African economies compared to Europe (Cobham & Robson, 1994:2).

Due to the different structure and institutional setting in developing economies, benefits from higher credibility of monetary and political institutions and financial integration may be higher. Debrun et al. (2011) criticize that the enhanced policy credibility that comes with membership in a monetary union has not been debated in the African context although it is very relevant there. Kronberger (2002) believes that welfare gains from policy coordination can be immense when cooperation helps to avoid aggressive policies that possibly harm neighbouring economies. Furthermore, Fritz and Muhlich (2010) argue that further financial integration due to a common currency can reduce the risk associated with original sin, the problem that comes with holding foreign debt in another currency, when economies can borrow in the regional domestic currency. However, since most developing economies are not sufficiently open and diversified in their production structure, intra-regional trade remains low, and the gains from economic integration cannot entirely be extracted.

On the costs side, the evaluation in developing regions differs as well. On the one hand, Fritz and Muhlich (2010) reason that the exchange rate must be seen as a potential cause of instability rather than as a balancing instrument in the context of developing economies. Kronberger (2002) agrees that if the instrument of competitive devaluation is no longer available, harmful practices such as the beggar-thy-neighbour policy cease to exist. On the other hand, if the exchange rate between growing economies becomes irrevocably fixed, the Balassa-Samuelson effect may cause imbalances if the economies' productivity growth differs significantly. Accordingly, Kronberger (2002) argues that economies may face high costs if a large productivity growth gap exists between members of a monetary union. With rigid real wages, the competitiveness of one economy deteriorates relative to other economies and cannot be restored using a competitive devaluation. Instead, a deflationary adjustment process is required to restore the relative competitiveness which suppresses growth. Kronberger (2002) also points to the importance of asymmetric shocks that result from poor macroeconomic policies and following adjustment attempts in developing regions. Those endogenous shocks have been neglected in previous research since they play only a minor role in industrialized economies.

3 The Common Monetary Area

This section sets out to provide an overview of the institutional design and history of the CMA agreement. Furthermore, it discusses previous research on the CMA in the fields of benefits and costs of the agreement and compliance with the OCA criteria. The section concludes by discussing the research gap that arises from topics that have not been covered before and deriving the topics treated in this thesis.

3.1 Institutional design

The CMA is a monetary agreement between South Africa, Lesotho, Swaziland, and Namibia which makes the Rand the common currency used by and in all member economies. The agreement cannot be considered a full-featured monetary union as, for instance, the Eurozone, since it contains elements of a monetary union and a currency board.[1] Even though the South African Rand is legal tender in all member economies, Namibia, Lesotho, and Swaziland issue national currencies. South Africa compensates the other members for forgone seigniorage due to the circulation of Rand in their economies (Masha et al., 2007). The commitment to the peg is not irrevocable for Swaziland which is allowed to drop the peg without further consultations with the remaining members (Asonuma et al., 2012). However, Lesotho and Namibia are obligated to back the issuance of their national currency by at least the same amount of foreign reserves. Movement of capital across national borders inside the CMA is not restricted, except for a minimum local asset requirement of around 5 % set up as development policy (Masha et al., 2007).

The SARB sets monetary policy for the Rand area. A yearly inflation rate of 3 to 6% is targeted which is supposed to stabilize the economy and promote sustained economic growth. The other CMA members have only limited options for setting an own monetary policy since they must defend the peg to the Rand. Apart from holding enough foreign reserves to back all issued national money, they maintain interest rates on the level of South African interest rates (Dlamini, 2014). While there remain some instruments, such as the bank rate or liquidity requirements to manipulate commercial banks' reserves, wide interest rate differentials and large capital outflows continue to be a worry for the small CMA economies' authorities (Nielsen et al., 2005). The set-up of the institutional framework supports a disciplined use of the budget since the small member countries cannot access monetary financing from the SARB and they have to back national currencies with foreign reserves (Tavlas, 2009).

[1] Still, when referring to the CMA, this thesis uses the terms monetary union, currency union and monetary arrangement interchangeably.

3.2 History

The CMA has its origins in the 19th century. Colonizers brought first European coins and later money issued by the British colonies into the British Protectorates in the areas of Lesotho, Swaziland, and Botswana. In 1909 the South Africa Act integrated those areas into the Union of South Africa, and in 1910 a customs union was established between all territories. In the legal framework, no word was written about the currency, but it was self-evident that the affiliated regions would take on the South African currency (Collings, 1978). With the establishment of the SARB in 1921, the South African Pound became the only legal tender, and present-day Namibia became a protectorate of South Africa and adopted the Pound.

In 1960 the Pound was replaced with the South African Rand and the South African Union became the Republic of South Africa. During the 1960s, Botswana, Lesotho, and Swaziland gained independence from South Africa, but the newly independent nations did not issue own currencies at first so that the informal monetary union continued to exist. In 1974, South Africa, Swaziland, Lesotho, and Botswana agreed on a formal treaty that established the Rand Monetary Area and that allowed member countries to issue own national currencies. Swaziland issued the lilangeni and pegged it at par to the Rand. Botswana left the agreement in 1975 and started to issue the pula which, at first, was also exclusively pegged to the Rand. In 1980, also Lesotho set up an own monetary authority and issued the loti pegged at a one-to-one rate to the Rand (van den Heever, 2010).

The CMA Trilateral Agreement entailed changes in the treaty from 1974 which made it more flexible and accommodated Namibia's official membership after its independence in 1993 although it had been a de facto member before. Moreover, Lesotho, Namibia, and Swaziland were granted independent control over their foreign exchange reserves. These concessions from the South African part were gladly made if it meant that the country could maintain diplomatic relations with neighbouring countries in a time of increasing isolation because of the apartheid regime. The latter was also one reason for Botswana to leave the agreement and emancipate itself. Contrarily to Swaziland, Lesotho, and Namibia, Botswana provided of the economic strength. Since the 1990s, all members' central bank governors can make recommendations for the SARB's monetary policy decisions; however, those are not binding (Jefferis, 2007). The customs union established in 1910 remained in force, but since the 1970s revenues were shared among all members with South Africa receiving 98.7% of customs revenues. Botswana remained a member of the Southern African Customs Union (SACU) when it exited the Rand Monetary Agreement. In 2002, a new revenue-sharing formula was introduced which is constructed of one component that is distributed due to the size of GDP and another component that is distributed due to differences in economic development (Masha et al., 2007). All SACU members also participate in the Southern African Development Community (SADC) which consists of 16 countries in southern Africa that cooperate in economic, political and security matters.

In recent years, the African continent has accomplished growth rates above the global average, and only some Asian economies have grown faster (Shaw, 2015). South Africa,

Namibia, and Lesotho belong to the emerging economies in Africa that have achieved stable economic growth above 2% in the last decade, have managed to further democracy, have strengthened leadership and mitigated poverty (Radelet, 2010:1-9). South Africa plays an important part in the rebound being not only the largest economy on the continent but also the most sophisticated whose further political and economic progress is crucial in leading the way for neighbouring economies (Radelet, 2010:23). During apartheid, South Africa was isolated and not able to integrate economically and politically with the region and globally; but in the 1990s, South Africa became part of several regional and continental integration projects which it is leading now (Shaw, 2015). Moreover, private capital flows from South Africa have been supporting the development in neighbouring economies (Radelet, 2010:23).

3.3 Previous empirical research

This section sets out to give an overview of previous empirical research on the CMA. An academic debate started after the Rand Area had been formalized in 1974. However, only a few articles about the CMA were published until the 2000s. Then, interest in the topic increased. Since all CMA members are also part of the SADC, several papers which focus on the SADC mention the CMA agreement but without especially considering the institutional design and other characteristics. A large part of the CMA literature analyses costs and benefits of the agreement. Another branch focuses on the compliance of the CMA with the OCA criteria. The question of the endogeneity of the CMA's optimality as currency union remains little explored.

3.3.1 Costs and benefits analysis

This section reviews literature that examines costs and benefits of the CMA arising for the member economies. Research focuses on the increased credibility of monetary policy and trade creation on the benefit side and asymmetric shocks on the cost side. Debrun and Masson (2013) construct a model that weighs both sides. With the framework, a counterfactual analysis of economic performance for the hypothetical alternative of monetary independence is conducted. The model is calibrated to critical macroeconomic features of the CMA. It compares benefits of monetary union arising from the credible coordination of domestic monetary policies and a changed interaction between monetary and fiscal institutions with the costs from asymmetric shocks. The data cover the period 1994-2005; the model computes significant benefits for the members of the CMA opposed to the counterfactual case of Namibia, Lesotho, and Swaziland being monetarily autonomous; it is found that benefits differ among the members. With a regional central bank, costs would arise from the lost anti-inflationary credibility that the SARB conveys. The model is limited in the sense that it does not consider potentially substantial gains from endogenous trade creation and the institutional design is not specified in detail. An earlier version of the model finds that domestic

institutional reforms may provide similar improvements as monetary unification while avoiding the costs arising from asymmetric shocks (Debrun et al., 2011).

Masson and Pattillo (2004) investigate how much the membership in the CMA contributed to intensive trade between the economies. They use a gravity model for bilateral trade of South Africa with the smaller member countries considering the year 1997 and demonstrate that the bilateral trading relationship would be around a third lower if the economies did not share a common currency.

A large strand of literature investigates if the SARB can accommodate all CMA members at once or if economic shocks hit asymmetrically. For this purpose, different methods are applied. To test if shocks are correlated CMA-wide, Bayoumi and Ostry (1997) estimate a second-order autoregressive model of per capita growth and interpret the residuals resulting from the AR(2) as shocks to output. They calculate the correlation of shocks among the CMA members and some SADC economies for the period 1963-1989. The correlations turn out mainly positive, but statistically insignificant. Grandes (2003) tests if there exists a common trend in the real exchange rates of the CMA members and Botswana between 1990 and 2000. He finds a cointegrated relationship in all real exchange rate pairs which indicates a co-movement of the real exchange rates. Hence, asymmetric shocks and policy changes do not appear to lead to a divergence of prices in the considered period.

Buigut and Valev (2006) test how synchronized demand and supply shocks hit the CMA members and some neighbouring SADC economies. A structural VAR model is applied that identifies shocks to output growth and inflation. The assumption that demand shocks do not affect output in the long term is used to differentiate between demand and supply shocks. During the period 1970-2002 demand and supply shocks respectively appear to be positively correlated among the CMA economies. Masha et al. (2007) apply the same approach as Bayoumi and Ostry (1997) using data from 1980 to 2005. They find mainly asymmetric correlations among the CMA members. Dlamini (2014) calculates the correlation of the CMA economies' output growth rates to the CMA area average and examines the composition of exports. He finds a low correlation between growth rates and the export structure indicates that shocks likely hit the CMA area asymmetrically in the period 1980-2007. Nzimande and Ngalawa (2016) apply a dynamic factor model which divides the business cycle of each CMA economy for the period from 1988 to 2014 into a common and an individual factor. They find that the members' business cycles seem to be driven by a common factor.

Nindi (2012) argues that a monetary policy measure can cause differing changes in prices and output across economies if different transmission mechanisms operate. To determine the impact of monetary policy shocks across the CMA economies a VAR analysis is applied. Nindi (2012) finds that the CMA members respond differently to the same monetary policy and the transmission mechanisms differ in their importance in the member economies.

3.3.2 OCA Theory applied

Masha et al. (2007) provide the most comprehensive analysis of the OCA criteria for the CMA considering data until 2005. The criterion of high labour mobility was better satisfied in the past when South Africa's mining sector attracted skilled labour. After the end of apartheid, the demand declined and, with it, the number of labour permits. However, under the roof of the SADC, community-wide facilitation of worker migration is aspired. Capital is highly mobile in the CMA area due to the intertwined banking sectors of the member economies. South African banking institutions are present in the smaller CMA economies which has created a unified financial system, even though the financial market development and depth differ across countries. Consequently, the CMA complies with the capital mobility criterion.

The small member economies are highly open to trade relative to the size of their GDP which means that the exchange rate-pass through effect is operating to a certain extent making the exchange rate less valuable as a balancing instrument. Namibia, Lesotho, and Swaziland import most goods and services from South Africa, but their exports mainly go to markets outside of the CMA. Masha et al. (2007) identify large amounts of South African exports to the small CMA members as a reason for similar inflation rates since the exports act as the transmission channel. After a price change in South Africa, the price level in Namibia, Lesotho, and Swaziland immediately adjusts.

Additionally, the CMA-wide inflation average is lower than in neighbouring economies in the SADC. Also, the government bond rates of the CMA economies are highly synchronized and low which may be a consequence of the fiscal discipline. Only Lesotho's debt exceeded 60% of its GDP around 2000. However, in the years after it has been reduced which can be traced back to its positive fiscal balance. Namibia and Swaziland registered a state deficit in most years between 2000 and 2006 which in some years exceeded 3% of GDP. Overall, the CMA members conform with the Maastricht criteria.

However, they do not satisfy the criterion of similar and diversified economic structures. While South Africa and Namibia focus on exports of primary products from mining, agriculture is the crucial sector in Lesotho and Swaziland. Moreover, Lesotho specializes in the production of textiles. The CMA agreement does not include any fiscal transfers between the members, but the SACU revenue distribution could act as fiscal transfers. However, Masha et al. (2007) do not find them to be countercyclical which is required for them to mitigate asymmetric shocks. To sum up, the CMA complies with most OCA criteria for the examined period 1980-2005 which may have helped to mitigate the occurrence of asymmetric shocks.

3.3.3 Areas of further research

Previous studies of costs and benefits and the OCA criteria yield varying results with a tendency to recommend the use of the Rand as common currency in the CMA. However, as

Debrun et al. (2011) note, investigations are biased to the cost side of African monetary unions. The benefits in this area are only little investigated, with the Debrun model as the only notable contribution. Masha et al. (2007) provide the only comprehensive test whether the CMA complies with the OCA criteria. Even though the monetary agreement had already existed since the 19th century, the southern African region has developed and changed both economically and politically through the 20th century up until nowadays. Few attempts have been made to investigate if, over time, the CMA members have become more or less suitable to use the Rand as a common currency. Only Masson and Pattillo (2004) measure the trade creation effect. However, their method of applying a panel dataset on the gravity model and introducing a common currency dummy is static since they use data from 1997 but do not compare to before or after. Tavlas (2009) notes that few studies have treated the endogeneity issue in the southern African region and calls for more research in the field.

Most investigations do not treat the CMA specifically as a monetary union between developing and emerging economies and do not consider alternative criteria in the evaluation of costs and benefits. Only the Debrun model considers the benefits of higher anti-inflationary credibility of the SARB for Namibia, Lesotho, and Swaziland. The government bond rate spread has been investigated only in the context of the OCA criteria to avoid the build-up of imbalances which mitigates the costs of a common currency. However, the measure has not been discussed as a proxy for the credibility of financial institutions.

The CMA can be classified as a monetary union between developing and emerging economies, but it differs in specific characteristics from attempts to monetary unification in the rest of Africa. The CMA's regulatory framework and design are quite sophisticated. The arrangement with a long tradition developed organically and was not designed from scratch which led to the historical structures that are still present in the current design. Additionally, the CMA is a special case of currency union since it is a hybrid of a monetary union and a currency board. Another interesting feature is the asymmetric political and economic dominance of South Africa.

Considering the fields that call for further research and the specific features of the CMA arrangement, this thesis examines the endogeneity of the CMA as an optimum currency area over time and proposes alternative measures of benefits and costs considering the approach to developing countries. Using a structural VAR, it is investigated whether shocks across the CMA economies have become more or less aligned over time. Moreover, it is analysed how the trading network among the members and in the region has evolved using descriptive trade statistics. The specific design and operation of monetary and fiscal institutions inside the CMA framework are examined to evaluate how the arrangement supports the credibility of monetary and fiscal institutions in the small member economies. Calculating the Taylor Rule optimal interest rate for each member, it is checked whether the SARB sets the interest rate in the money market considering all member economies' welfare or whether it is biased towards the South African economy. Additionally, benefits arising from the anti-inflationary credibility of the SARB and the opportunity to borrow in the domestic currency are discussed.

4 Endogeneity analysis

4.1 Asymmetry of shocks

This section sets out to econometrically evaluate the suitability of the CMA members to be led by one common central bank which sets monetary policy for the whole area and how this has evolved over time. For this purpose, it is measured how large the common component of economic shocks with South Africa is in the small members' economies. The larger the common component, the more explanatory power have movements in the South African economy for Namibia's, Lesotho's, and Swaziland's economic fluctuations and the easier is it to accommodate all member economies with one monetary policy setting. Additionally, if the common component of shocks with South Africa has grown over time, the monetary agreement can be judged to be endogenous, meaning that the suitability of the member economies to form a monetary union has increased over time.

4.1.1 Motivation and hypotheses

The question of whether shocks have a large common component and the symmetry of shocks is endogenous over time can be expressed as the following hypotheses:

H1. Economic shocks to the South African and Namibian economy have a large common component**.**[2]

H2. Economic shocks to the South African and Basotho economy have a large common component. Over the observation period, the share of the common component has grown.

H3. Economic shocks to the South African and Swazi economy have a large common component. Over the observation period, the share of the common component has grown.

Different approaches have been applied to measure the symmetry of shocks in monetary unions. Structural VARs are often used since, contrarily to the reduced-form VAR, they also consider the contemporaneous relationship between the variables. To measure in which manner shocks hit the CMA, Buigut and Valev (2006) apply a structural VAR including GDP growth and inflation to differentiate between demand and supply shocks. They then test if the correlation of supply and demand shocks respectively across economies is positive. This

[2] Due to unavailability of earlier data for the Namibian case, it cannot be tested for endogeneity. Read more on this issue in the data and model section.

method has been applied in several cases and offers an analysis of the correlation of macroeconomic disturbances, but the method has some drawbacks. The approach does not differentiate between local, regional and global shocks. Consequently, it does not check if shocks are common to a much larger group of economies so that a larger currency union would be optimal for the considered region or even the adoption of a global currency, for instance, the option of dollarization.

Moreover, Buigut and Valev (2006) take restrictive assumptions. They identify supply and demand shocks according to the Aggregate Supply-Aggregate Demand framework in which demand shocks do not have any long-term effects on output. However, several economists have found that, in reality, both supply and demand shocks' effects on output can be permanent (Bashar, 2011).

This thesis adopts an approach that Chow and Kim (2003) and Zhao and Kim (2009) used before. The structural VAR model includes lags of the output of monetary union members and major global trading partners so that shocks can be decomposed in a global, regional and local component. Common responses of the South African and the small CMA members' economies to global shocks can be measured, and transmission channels of shocks in the South African economy to Namibian, Basotho, and Swazi output can be identified. Moreover, by splitting the observation period into an earlier and a later phase, the evolution of symmetry of shocks over time can be analysed.

4.1.2 The data

The data stem from the Word Bank Database. However, recent investigations have shown that the accuracy of macroeconomic data from developing economies, and in particular from Africa, should not be overestimated (Kerner et al., 2017; Jerven & Johnston, 2015). The analysis uses annual GDP in US$ in constant prices with 2010 as the base year. GDP is logarithmized in the models. Table 1 presents the variables included. Apart from the CMA members, a further variable is created that includes shares of GDP of important trading partners of South Africa and the CMA region. The composition depends on the trade weights of the US, the UK, Germany, Japan, and China in the period 2000-2002[3]. Global1 incorporates 27% of US and German GDP, and 22%, 17% and 7% of UK, Japanese and Chinese GDP respectively. The global1 variable has the highest mean since it consists of the GDP of industrialized economies. South African GDP is also high on average over time compared to Namibian, Swazi, and Lesotho GDP, with the latter having the smallest GDP. This distribution does not only reflect per capita income levels but also indicates the different population sizes. The Basotho and Swazi output is also quite volatile compared to the less volatile GDP of the other economies. Over the considered period, the ranking of the size of the economies does not change. The data cover the period 1960 to 2016, except for Swaziland

[3] Trade data were collected from the UN COMTRADE Database (2017).

for which data exist since 1970 and for Namibia with data available since 1980. A graphical presentation of the time series can be found in figures 7 to 11.

Table 1: Descriptive statistics

Variable	Mean	Std. Dev.	Min	Max	N	Period
ln southafrica	26.06	0.448	25.09	26.76	57	1960-2016
ln namibia	22.69	0.404	20.06	23.43	37	1980-2016
ln lesotho	20.65	0.770	19.20	21.82	57	1960-2016
ln swaziland	21.44	0.709	20.09	22.38	47	1970-2016
ln lnglobal1	28.99	0.476	28.07	29.70	57	1960-2016

Table 2 displays the Pearson correlation coefficient between the series in first differences. Differencing removes the trend in the series so that mainly only business cycle movements remain. So, the correlation of economic fluctuations can roughly be evaluated. Most correlations between the CMA members are quite small but positive with the highest between South Africa and Namibia and Swaziland respectively. However, Swazi economic activity is negatively correlated with the Namibian and Basotho economy. The correlation with the global trading partners variable is positive but relatively small for all CMA economies. It is highest with Lesotho and lowest with Swaziland.

Table 2: Pearson correlation coefficient of differenced series

Variable	d.lnsouthafrica	d.lnnamibia	d.lnlesotho	d.lnswaziland	d.lnglobal1
d.ln southafrica	1.000				
d.ln namibia	0.212	1.000			
d.ln lesotho	0.115	0.059	1.000		
d.ln swaziland	0.208	-0.063	-0.236	1.000	
d.ln global1	0.185	0.058	0.281	0.045	1.000

Some limitations to the scope of the analysis arise due to restricted availability of data. Quarterly instead of annual GDP data would be more suitable to detect very short-term shocks and effects of under twelve months which would provide more precise results. Moreover, the full range of data from 1960 is not available for Namibia and Swaziland, so that due to too few observations the endogeneity analysis cannot be conducted for the case of Namibia.

4.1.3 Testing for stationarity

The first step is to determine the order of integration of each series, to arrive at the appropriate specification of the VAR model. Methods of visual inspection, autocorrelograms, and two different unit root tests are used to detect if the series are stationary. When considering figures 7 to 11, none of the series appears to have a constant mean and variance. Also, in the autocorrelograms (cf. figures 12 to 16) lags do not die out quickly for any of the series which points to non-stationarity of all series in levels. To confirm this, the Phillips-Perron Test (PP Test) and the Augmented Dickey-Fuller Test (ADF Test) are applied to each series. The PP Test is performed with one Newey-West lag while the ADF Test follows the Pantula principle which recommends testing down from a large number of lags, checking for autocorrelation until the last lag is statistically significant to the 5% level. Both tests support that all series are non-stationary in levels (cf. tables 5 and 6). Hence, to determine the order of integration, each series needs to be differenced and the procedure to be conducted with those series.

The differenced series seem to have a more constant variance and mean (cf. figures 17 to 21). A look on the correlograms confirms that since the autocorrelations appear to emerge randomly (cf. figures 22 to 26) though no definitive claim of stationarity can be derived from this. The results from the PP and ADF Test confirm stationarity for all differenced series (cf. tables 7 and 8) which implies that the series are likely integrated of order 1.

The analysis will work with subsets of the observation periods which will be compared to each other to detect endogenous mechanisms. Hence, the subperiods must be stationary as well to include them in the VAR model. It is likely that a section of a stationary series is also stationary but to dismiss any doubt, the subperiods in differences are checked for stationarity, as well, by visual inspection of correlograms and using the PP and ADF Test. The correlograms are inconclusive though for most subsets autocorrelation appears to die out quickly (cf. figures 27 to 36). It results from the tests that none of the subperiods contains a unit root (cf. tables 9 and 10). Hence, they are stationary according to both tests, except differenced South African GDP between 1970 and 2000 measured with the ADF Test. Consequently, all subsets will be treated as integrated of order 1.[4]

4.1.4 The structural VAR model

This section discusses the theoretic construction of the VAR model that is used to measure how symmetrically economic shocks hit the CMA area. The choice of the model and methodology are discussed, and the model used for the analysis is presented.

Structural VAR models of logged series in first differences are estimated for each of the small CMA members to obtain the common component of economic shocks with the South African

[4] Hence, the analysis will use the differenced series of the logged levels. The following sections only treat differenced logged series even if not stated explicitly.

economy. VARs are practical for such kind of analysis since they consider different directions of predictive causality between the variables. When no restrictions are imposed, VAR models treat all variables endogenously which means that no assumptions are taken about the direction of effects between incorporated variables. Structural VARs are often used since, compared to the reduced form VAR, they possess some useful features by design. They allow measuring contemporaneous effects between variables and the effect of a shock in one equation while holding all other shocks constant since the error terms are decomposed into mutually uncorrelated shocks in the structural form. Moreover, it is possible to impose certain restrictions derived from economic theory. It can be determined that specific variables do not contemporaneously affect a variable so that only a lagged response is allowed.

The analysis is conducted with series in logs since the economies' sizes and growth rates differ and the rescaling facilitates the interpretation and the comparison among models and leads to more normally distributed residuals in the estimations. The VAR is estimated in first differences which assures that all series are stationary.[5] The interpretation of estimation results is made through the variance decomposition of forecast errors which reveals the importance of domestic, regional and global shocks by indicating how much of the forecast error variance of each variable is explained by exogenous shocks to the other variables included in the model.

The specific structural VAR model used in this thesis is constructed of three variables. The global1 variable is a proxy for global economic shocks. South African output reflects regional economic shocks. One model is constructed for each of the small CMA members, so the third local economy variable is represented by Namibian, Basotho, or Swazi output respectively. The model analyses how symmetrically shocks hit in the southern African region, measuring the size of the common regional component of shocks. Moreover, the model measures the existence and strength of transmission mechanisms between economies when considering a three-years lagged response. The transmission of economic shocks in South Africa to the small CMA members is of primary interest here. A quick transmission of shocks taking place in the next period, which means a high common component in the forecast error variance, may be a sign of high economic integration between economies and that it may be easier for the SARB to accommodate all CMA members with its monetary policy.

The model looks like the following for the case of Namibia, testing hypothesis H1.:

Model 1

(1) $d.ln\_global1_t = \alpha_1 + \beta_1 d.ln\_global1_{t-1} + \gamma_1 d.ln\_south\_africa_{t-1} + \delta_1 d.ln\_namibia_{t-1} + \varepsilon_t^{d.ln\_global1}$

(2) $d.ln\_south\_africa_t = \alpha_2 + \beta_2 d.ln\_global1_{t-1} + \gamma_2 d.ln\_south\_africa_{t-1} + \delta_2 d.ln\_namibia_{t-1} + \varepsilon_t^{d.ln\_south\_africa}$

(3) $d.ln\_namibia_t = \alpha_3 + \beta_3 d.ln\_global1_{t-1} + \gamma_3 d.ln\_south\_africa_{t-1} + \delta_3 d.ln\_namibia_{t-1} + \varepsilon_t^{d.ln\_brazil}$

[5] Cf. section 4.1.3 which concludes that all series are integrated of order 1.

Each of the models is estimated using three lags of each variable[6]. Although the information selection criteria recommend varying numbers of lags for the different models, the uniform number of three lags is applied to all[7] which facilitates the comparison across models. Moreover, models with a higher number of lags perform better in the Jarque-Bera Test of non-normality of residuals and the Lagrange Multiplier Test of autocorrelation between the residuals. A special feature of this model is the small economy assumption that is imposed. It is assumed that Lesotho, Namibia, and Swaziland have no contemporaneous influence on the South African regional economy and the economies of global trading partners. Moreover, shocks to South African output do not affect global economies in the same period but only with a lag.

To track the evolution of the common components and the strength of the transmission mechanisms over time two models are estimated for Lesotho and Swaziland. For the Basotho case, a model is estimated for the period 1960-1990 and 1987-2016. Data for Swaziland only start from 1970, so the two estimated models cover the periods 1970-2000 and 1987-2016[8]. The first period is supposed to capture the economic structures during apartheid while during the second period the South African economy became more open to global influences and the CMA agreement turned more symmetric with less dominance from the South African part. Moreover, the southern African region became economically more dynamic. All CMA members developed their economies over time so that the second period reflects more sophisticated economic structures and, possibly, more integration between the countries. Unfortunately, data coverage for Namibia only starts in 1980 so that the endogeneity analysis cannot be conducted for the Namibian case. However, a model for the period of available data 1980-2016 is estimated and compared to the results for Lesotho and Swaziland to evaluate how symmetry of shocks and transmission mechanisms vary among the CMA members.

4.1.5 Results

Each model is interpreted using the forecast error variance decomposition. The latter presents the amount of information included in each variable that is contributed by the other variables in the model. This means that it indicates how much of the variance of forecast errors of each variable is explained by exogenous shocks to other variables. So, the importance of domestic, regional and global shocks can be evaluated, and answers about the working of the symmetry of shocks and transmission mechanisms can be found. This investigation is interested in the short and medium term of the symmetry of shocks defined as how observations of the variables one year and three years back contribute to the variance of forecast errors because this is the time range in that monetary policy operates. Consequently, the analysis considers

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[6] The model above is presented with only one lag due to constraints of space.
[7] An overview of information selection criteria for all models can be found in tables 12, 15, 18, 21 and 24 respectively.
[8] The overlap of the periods is unavoidable since valid inferences from the models can only be made with a sufficient number of observations. This thesis uses at least 30 observations for each model.

the forecast error variance decomposition of the one and three years lagged observations of the variables. Table 3 gives an overview of the results from all models.

Table 3: Forecast error variance decomposition

	domestic component	**regional component d.ln southafrica**	**global component d.ln global1**
Model 1			
d.ln namibia 1980-2016			
one year lagged	0.90	0.01	0.10
three years lagged	0.82	0.07	0.11
Model 2.1			
d.ln lesotho 1960-1990			
one year lagged	0.65	0.24	0.11
three years lagged	0.61	0.27	0.12
Model 2.2			
d.ln lesotho 1987-2016			
one year lagged	0.93	0.01	0.06
three years lagged	0.77	0.19	0.04
Model 3.1			
d.ln swaziland 1970-2000			
one year lagged	0.96	0.00	0.04
three years lagged	0.75	0.04	0.01
Model 3.2			
d.ln swaziland 1987-2016			
one year lagged	0.72	0.03	0.25
three years lagged	0.64	0.13	0.23

In each of the models 1 to 3.1, the domestic component presents the percentage of forecast error variance in the equation with Namibian, Basotho, and Swazi output as dependent variable that is explained by the lagged observations of Namibian, Basotho, and Swazi output

respectively.[9] South African output represents the regional component. It indicates how much of the variance of forecast errors for Namibian, Basotho, and Swazi output is explained by South African lagged output for each of the small CMA members. The global component provides the share of the forecast error variance that is explained by economic fluctuations in the economies of the global trading partners US, China, Japan, Britain, and Germany. The short-term component uses one-year lagged observations to explain the share of the variance of forecast errors of domestic, regional and global output respectively. The medium-term component considers a three-year lag of observations of all variables.

Model 1 Namibia 1980-2016

Over the period 1980-2016, shocks to the Namibian economy have a very large short-term domestic component of 90%, while the regional component only makes up 1%. The global component consists of 10%.[10] In the medium term, the domestic component is slightly lower (82%), while the regional component increases to 7% and the global component gains 1%.

Residual diagnostic tests are conducted for each model. For Model 1, the Jarque-Bera Test indicates a non-normally skewed distribution of the residuals (cf. table 13). The global1 variable is responsible for the outcome, and this may be due to its construction from several components. Taking logs of all variables eases the problem but does not resolve it completely. Autocorrelation among residuals measured with the Lagrange Multiplier Test is not a problem (cf. table 14).

Model 2.1 Lesotho 1960-1990

Between 1960 and 1990 the domestic component makes up 65% in the short run. Considering three lags, it is 61%. In the short run, the regional component amounts to almost a quarter and in the medium run to 27%. The global component explains 11% in the short run and 12% in the medium run. The Jarque-Bera Test indicates problems with both kurtosis and skewness of the distribution of residuals for the global1 variable (cf. table 16). However, no autocorrelation is detected in the residuals (cf. table 17).

Model 2.2 Lesotho 1987-2016

In the recent period, the domestic component of shocks to Basotho output is largest with 93% in the short run and 77% in the medium run. The regional and global components are rather small, making up 1% and 6% considering one-year lags and 19% and 4% when considering three-year lags. Neither non-normality nor autocorrelation of the residuals exist (cf. tables 19 and 20).

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[9] Table 3 represents the results of the variance decomposition of forecast errors arising from the third line of the example of the model on page 21.

[10] Due to rounding, the percentage numbers do not add up to exactly 100%.

Model 3.1 Swaziland 1970-2000

Considering one lag, the domestic component explains 96% and the global component 4%. When considering three lags, domestic shocks explain 75%, regional shocks 4%, and global shocks 1% of the forecast error variance. Both non-normality and autocorrelation of residuals are ruled out (cf. tables 22 and 23).

Model 3.2 Swaziland 1987-2016

Considering one lag, the share that explains the forecast error variance amounts to 72% domestically, 3% regionally and 25% globally. Considering three lags, it is 64% for domestic shocks, 13% for regional shocks and 23% for global shocks. In this model, no significant autocorrelation of the residuals exists (cf. table 26). However, the residuals of the global1 variable are non-normally distributed (cf. table 25).

Results

Concluding from the outcome of the analysis it would not be recommended for Namibia, Lesotho, and Swaziland to form a monetary union with South Africa since the domestic component turns out high for all small CMA members. Regional and global components are low. This indicates that economic shocks hit the area quite asymmetrically so that it is challenging for a common central bank to accommodate all economies using one monetary policy.

Over time, economic shocks to Lesotho have become even less symmetric with the South African economy while Swazi output fluctuations became slightly more synchronized with South Africa but to a more considerable extent with global trading partners. Swaziland seems to have integrated more into the global economy, but this does not seem to have led to much higher correlated shocks with the South African economy. None of the hypotheses 1 to 3 can be confirmed.

Zhao and Kim (2009) conduct a similar analysis for the economies in the Eurozone using the same methodology, covering the period 1970-2004. They find common regional shares of up to 70% for Austria and France. The lowest regional components have Ireland (10%) and Italy (5%), but for those, the global component amounts to around 80%. Even the Eurozone is often criticized as being too asymmetric, but there the symmetry of shocks is much higher than in the CMA area.

4.1.6 Robustness check

The analysis above shows that the component that is common with major trading partners does not play an important role in the small CMA economies. Consequently, adopting a global currency would not help to balance economic shocks. Another specification is tested here for which the global1 variable is excluded from the model. The two-variable VAR is estimated in the same design; the small CMA members cannot affect the South African

economy. Three lags are used for all the models and the observation periods remain the same. Minor autocorrelation of the residuals arises in Models 1 and 3.1. Moreover, in Model 3.1 the residuals of the South African variable are non-normally distributed; the distribution has a slight problem of kurtosis. The corresponding tables are 27 to 39.

The results of the robustness check are given in table 11. They confirm the overall conclusion from the main analysis. The regional component remains very small in all models. Shocks hit the CMA area quite asymmetrically. The common component with South Africa reaches a slightly higher level for Lesotho during the period 1960-1990 compared to the original specification. Additionally, in the second subset, the common component of Swaziland with South Africa is higher. Likely, the common global component from the original specification is here included in the African component. The endogeneity question cannot be answered in the affirmative. The common regional component with South Africa drops over time in Lesotho. The Swazi regional common component with South Africa rises only when leaving out the global component. No endogeneity of the symmetry of shocks is detected; it is challenging to accommodate all CMA members with one common monetary policy.

4.2 Trade Creation

4.2.1 Motivation

This section investigates how intra-CMA trade and trade relations with neighbouring economies outside of the CMA area have developed in recent years considering the dynamic environment and structural and organizational changes. With a shared common currency, economies are assumed to integrate further, and trade is supposed to increase due to reduced transaction costs and no exchange rate risk. The CMA members have been sharing the Rand as common currency for a long time. Moreover, a historically grown customs union that also includes Botswana as a member ensures trade without barriers inside the area of the SACU. After more than 100 years of monetary and economic integration, the level of intra-CMA trade is expected to be significantly higher than trading relations with partners outside of the CMA area.

Nowadays, the whole southern African region constitutes a dynamic environment. Structural and organizational changes have occurred in recent years. The SADC established a free trade area among its members in 2008 so that the CMA members trade freely with all their neighbours. Additionally, after the end of apartheid South African relations with the rest of the world have improved and the South African economy turned more towards global markets. Due to data unavailability, the analysis focuses only on this very recent period. As far as the data coverage serves, it examines the trade structure inside the region and the dynamics since 2000.

4.2.2 The data and descriptive statistics

This section reviews several statistics referring to the evolution of trade by the CMA members with each other, with their neighbouring economies and with the world. First, general figures such as the openness to trade and the evolution of total imports and exports are discussed. After, bilateral trade data are examined to illustrate the trade relationship of the CMA economies with one another.

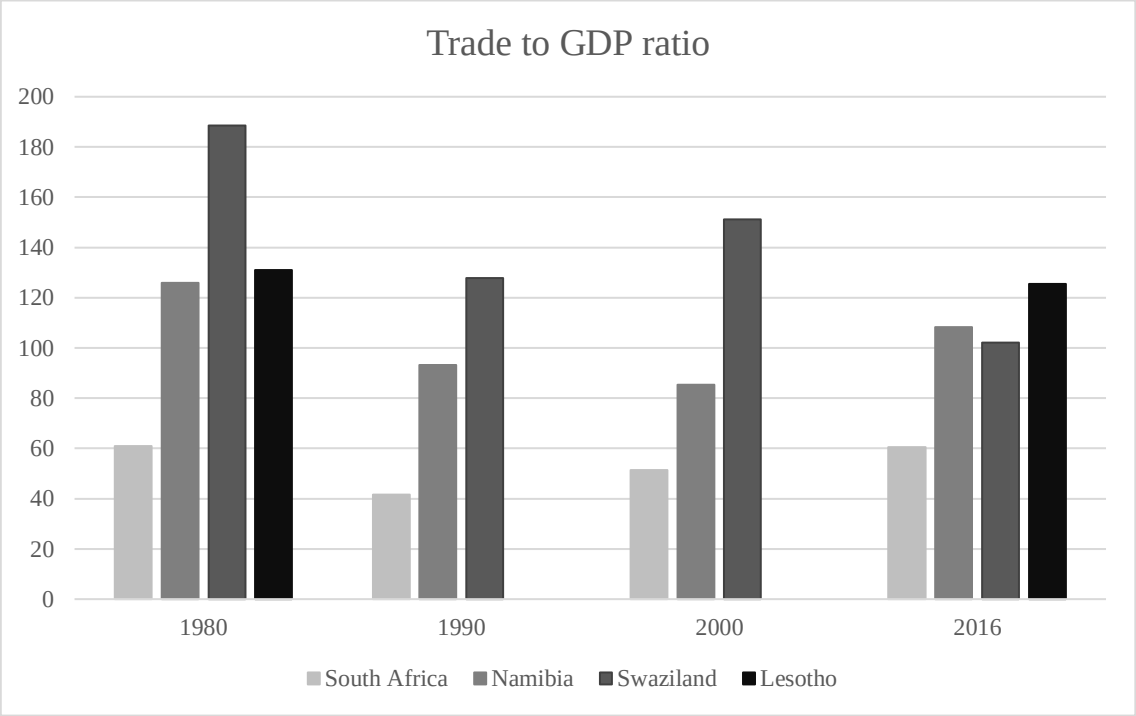

Figure 1: Openness to trade of CMA members, 1980-2016
Source: World Development Indicators, World Bank Database (2018).

The trade to GDP ratio, a measure of the degree of openness to trade of an economy, indicates if an economy is rather autarkic or if it exchanges large amounts of goods and services with other economies. Small economies tend to be more open than large economies since the domestic market is smaller. On average, the trade to GDP ratio, a measure of the degree of openness to trade of an economy, is around 60% in Sub-Saharan Africa. Figure 1 shows that the small CMA economies engage in more extensive trade than the Sub-Saharan average while South Africa falls into the average. The CMA agreement does not seem to push trade relations in general. For South Africa, openness to trade decreases but increases again to 60% in the period 1980-2016. Swaziland started out with a rate of 190% in 1980 which decreased in the following decades. The Basotho rate seems to have remained about stable around 130%, while Namibia's rate seems to have decreased from 130% but in 2016 was at 110% again. The figures mirror the recent dynamic evolution of trade of the CMA members.

The dynamic growth of trade is also mirrored in the evolution of total export and import flows of South Africa and Namibia (cf. figure 2). Due to the large size of the South African economy, its trade flows have a much higher volume. Both export and import flows have increased in all economies since 1960 but with high fluctuations. Over the observation period,

South African and Namibian imports and exports were most dynamic with the strongest growth since 1990. The take-off falls together with Namibia's independence from South Africa and the end of apartheid. Swaziland's and Lesotho's trade flows have grown more slowly. South Africa has had a trade surplus until 2011. After, its imports grew larger than its exports. Namibian trade flows were about balanced until 2007 when imports started to grow much more dynamically than exports. Swaziland's imports were higher than its exports most of the time but with only a small gap in between that has closed in recent years. However, Basotho imports have been growing stronger than exports since the 1980s, creating a strongly negative trade balance at the end of the observation period. Figure 2 demonstrates that the CMA members' trade relations have not increased parallelly, but Lesotho and Swaziland seem to have fallen behind.

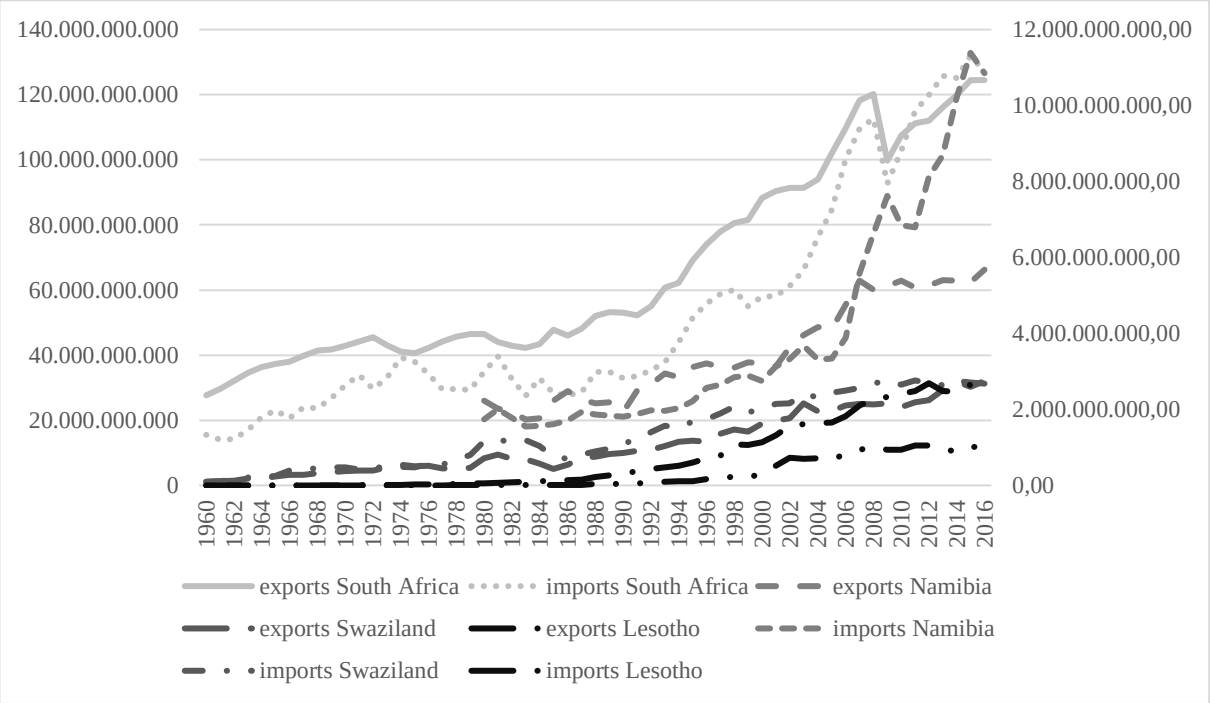

Figure 2: Imports and exports in goods and services in constant US$ (base year 2010), 1960-2016
Source: World Development Indicators, World Bank Database (2018).
South African trade flows are recorded on the right axis.

The bilateral trade data stem from the Direction of Trade Database by the IMF. The database covers bilateral trade, consisting of import and export flows in goods and services, in US$ since 2000. However, trade flows for several years are not available for some CMA economies. Moreover, a discrepancy exists between some trade flows reported by trading partners. When interpreting the trade statistics, it needs to be born in mind that the accuracy of the numbers may be low.

In the following, import and export flows of South Africa, Namibia and Swaziland with the other CMA members and other economies in the region are analysed in proportion to their total import and export flows. Other neighbouring economies include Botswana, Angola, Zambia, Zimbabwe, Malawi, Mozambique, Madagascar, and Tanzania. For Namibian and South African trade flows data exist in the years 2000-2002 and 2014-2016 so that the averages of those three-year periods can be compared and the evolution of trade in the region

in recent times evaluated. For Swaziland, data exist only for the years 2000-2002. No data on Basotho trade flows are available. An average of three years instead of the value of US$ in trade flows in only one year is considered to account for short-term business cycle fluctuations. In the cases when values are not available for all three years, an average of two years is calculated or the only available value in the period is used to proxy the period.

No noteworthy imports of South Africa from the CMA members and Botswana are registered between 2000 and 2002 (cf. table 40). Less than 1% of South African total imports come from Angola, Zambia, Zimbabwe, and Malawi. The data coverage on exports leaving South Africa to other economies in the region is poor. Exports to Namibia are extremely small; also all other available figures of economies in the region remain under 1% of South African total imports.

In the period 2014-2016 South African trade with the other CMA members intensifies, especially for Namibia; and so does trade with other neighbouring economies (cf. table 41). Increases in imports are more pronounced than in exports. Angola becomes the most important trading partner in the region, probably due to its size.

The data confirm the role of South Africa as a provider for the region, while the economy does not import a considerable amount from neighbouring economies. The economies in the region are small so that even with intensive trading it is difficult for any of them to make up a significant proportion of South African trade. However, the trade flows are smaller than expected when considering that those economies are South Africa's direct neighbours. The South African economy seems to be linked more globally with the most important trading partners located outside of the region and Africa around 2000. One and a half decades later the importance of trade with the region has increased, but South African trade with the other CMA members remains below expectations.

Namibia's most important trading partner since 2000 is South Africa (cf. tables 42 and 43). Namibia exports around 10% of its total exports to South Africa with a small decrease since 2000. Moreover, it imports around 40% from its big neighbour with a small increase since 2000. Lesotho is another important buyer of Namibian products in 2000-2002. However, in 2014-2016 imports to Lesotho are not relevant anymore. Outside of the area, Angola is an important buyer in 2000-2002. Apart from that, no noteworthy trade relationships exist with other economies in the region around 2000. 15 years later, Botswana and Zambia have also intensified trade with Namibia.

Namibia imports a larger share in 2014-2016 from the CMA than it does in 2000-2002, but exports to the CMA decrease. The share of imports from the southern African region, taking together the CMA members and the neighbouring economies Angola, Botswana, Zimbabwe, Zambia, Mozambique, Madagascar, Tanzania, and Zambia, increases from 39% to 46% of total imports. However, the share on the exports side decreases from 25% to 21% of total exports. Exports to only the CMA members make up 21% in 2000-2002 and 8% in 2014-2016. The sharp decrease originates from a substantial increase in exports to Botswana and a

strong decrease in exports to Lesotho. On the exports side, the CMA share increases from 38 to 42%.

In the period 2000-2002 Swaziland exports most goods and services to South Africa (22%) and imports most from Lesotho (41%) (cf. table 44). Apart from that, trading relations to the CMA members are not meaningful. Concerning other neighbouring economies, Swaziland only exports a considerable share to Mozambique, making up 4% of its total exports.

4.2.3 Results

The descriptive analysis of trade flows does not find a common currency trade-enhancing effect that would boost intra-CMA trade so that benefits from extensive trade inside the CMA turn out much smaller than expected. Over the observation period, intra-CMA trade has not apparently gone up and was about as dynamical as trading connections of CMA members with neighbouring economies outside of the monetary union. Individual links inside the CMA are strong but rather unidirectional. However, not all CMA members trade sizeable amounts of goods and services among each other. South Africa provides the most significant share of the goods and services that are imported by Namibia and Swaziland.

Trade in the wider southern African region developed dynamically which may be due to the recently created free trade area under the roof of the SADC or the more dynamic development of the region in general. Trading connections of the CMA economies with neighbouring economies outside of the agreement are partially stronger than with other CMA members. However, this can mainly be ascribed to the size effect. Of the considered economies, Lesotho, Namibia, and Swaziland have the smallest population and together with Malawi the lowest GDP. Consequently, the scope for trading is smaller.

In general, CMA economies trade extensively in relation to their GDP, especially the smaller members, but rather with the outside of the southern African union. The small CMA member economies are still little sophisticated and diversified so that naturally trade is less encouraged between them than with the outside of the region.

In the EU, the creation of the Common Market alone has enhanced trade inside the EU by 3.2% faster per year than it would have grown without the Common Market (Eichengreen, 2008). Moreover, already six years after the introduction of the Euro as the common currency, a trade-increasing effect of the Euro of between 5 and 10% inside the Eurozone was found by several studies (Baldwin, 2006). When comparing those numbers to the results on the CMA, it needs to be considered that the Eurozone economies are a lot more sophisticated and diversified which significantly enhances the scope for trade among them. Additionally, the area of the Eurozone is larger including more economies and a higher total GDP and population. However, the CMA agreement has existed for much longer time including a common currency and a common market since the beginning of the 20th century.

5 The operation of institutions

The impact of institutions and their interactions have not been discussed comprehensively in traditional OCA and monetary unions research. However, institutions set the incentives after which society and economy operate and further or impede economic growth (North, 1991). That is why it is essential to consider them when weighting costs and benefits of monetary union. This section sets out to discuss the operation of monetary and fiscal institutions and in which ways it benefits and harms the small CMA economies. First, a test on the monetary policy of the SARB is conducted of how suitable it is for the individual member economies, and implications of the results are discussed. Second, the impact of the SARB's policy on anti-inflationary credibility and government debt interest of the small CMA members is considered. Third, the problem of original sin when using the Rand as a common currency is evaluated. Last, the trade-off arising from the Impossible Trinity concept is addressed and alternatives to participating in the monetary union are discussed for Namibia, Swaziland, and Lesotho.

5.1 Monetary policy by the SARB

The calculation of the counterfactual optimal money market interest rate according to the Taylor Rule for all CMA economies provides a test of whether the SARB's monetary policy manages to accommodate all members or whether it is biased towards the South African economy. If the results from the Taylor Rule match the SARB's key interest rate to a similar degree for all CMA economies, the policy setting appears to be balanced. If the Taylor Rule results for South Africa match the SARB's key interest rate closely while a large differential arises for the Namibian, Basotho, and Swazi economies, the SARB's monetary policy is biased.

The SARB sets the monetary policy for the whole CMA area. The small CMA economies have own central banks that work on maintaining the peg at par. Consequently, no scope is left for setting an own monetary policy to balance domestic cyclical movements. Since the 1990s, the Namibian, Basotho, and Swazi central bank governors have an advisory role in the SARB's board which decides the monetary policy, but the input is not binding. This raises the question whether the SARB considers the welfare of all economies when setting the interest rate on the money market. Or does the SARB mainly only factor in South African national interests? This question is even more relevant when considering the results from the analysis of the symmetry of shocks. Since the common component of shocks between the South African economy and the small CMA members is small and shocks hit the region rather

asymmetrically, a consideration of the current economic situation in Namibia, Lesotho, and Swaziland is especially relevant when setting the money market interest rate. Otherwise, monetary policy may be countercyclical and counterproductive for the small member economies. Moreover, if the optimal money market interest rates for each economy differ widely, even an average of the optimum interest rates of the members may harm some or all CMA economies. A common monetary policy can aggravate national cyclical fluctuations of the economies (De Grauwe, 2013a). This happens when the central bank overheats some economies by providing too much liquidity while deflation is promoted in other regions which would need a lower interest rate to promote investment and consumption, at the same time. In the long term, those imbalances can corrupt the catch-up and income converge inside a monetary union when exchange rate adjustments are not available to balance differences in inflation and productivity change (Johansson & Ljungberg, 2013).

Calculating the Taylor Rule optimal money market interest rate for the CMA economies provides a test of whether the SARB's monetary policy fits for the whole monetary union or whether it is only directed towards stabilizing the South African economy. The Taylor Rule was constructed by Taylor (1993) as a formula to calculate how central banks should set the interest rate for the money market to accomplish the inflation target, considering inflation expectations and the current output gap. Economists have tested the rule for many cases and found that most central banks follow the Taylor Rule or some variation of it. In the following, the Taylor Rule is presented:

$$r = p + 0.5\, y + 0.5\, (p - p^*) + p^{eq}$$

To calculate the rate at which the central bank should set the money market interest rate to maintain an inflation rate close to the target, the contemporaneous inflation rate p, the GDP gap y, the inflation target p^* and the long-term real interest rate p^{eq} are required.

The calculations and analysis follow Johansson and Ljungberg (2013) who establish a test for the fit of the "one-size-fits-all" monetary policy by the ECB for the Eurozone members. On the basis of the Taylor Rule, they set up the "ECB Rule" and use the formula to estimate the monetary policy rates that would have fitted for the individual Euro economies between 1999 and 2008. They use the results from this to calculate the average difference between the maximum ECB Rule rate in the Eurozone and the actual ECB interest rate.

In this analysis, the Taylor Rule formula from above is used. Contemporaneous expected inflation is proxied by the current inflation rate. The percentage deviation of GDP growth from potential GDP growth, the GDP gap, is proxied by the cyclical deviation from the trend of the series. The Hodrick-Prescott filter is used to separate the cyclical component as, for instance, Grech (2014) does, using an HP parameter value of 6 as recommended for annual data by Ravn and Uhlig (2002). Then, the percentage deviation of the cycle from the trend of GDP growth is calculated as the GDP gap. The inflation target is set in a range from 3 to 6% since 2000 for the SARB (Van der Merwe, 2004). Before, the SARB targeted the money supply. The other CMA economies have adopted the target range of 3 to 6% (Mpaki, 2016). The Taylor Rule is calculated using a long-term real interest rate of 2%. Different estimates

for different economies exist, but 2% is used as a standard in most calculations of the Taylor Rule.

Figure 3 presents the results from the calculation of the Taylor Rule and the SARB key interest rate in one graph. The SARB key interest rate seems to follow the South African Taylor Rule-calculated interest rate most closely but more in the time before 2008 than after. This may be due to the more exceptional situation after the financial crisis in 2008 where the Taylor Rule values do not fit perfectly. They seem to be too low for all CMA members over most of the period.

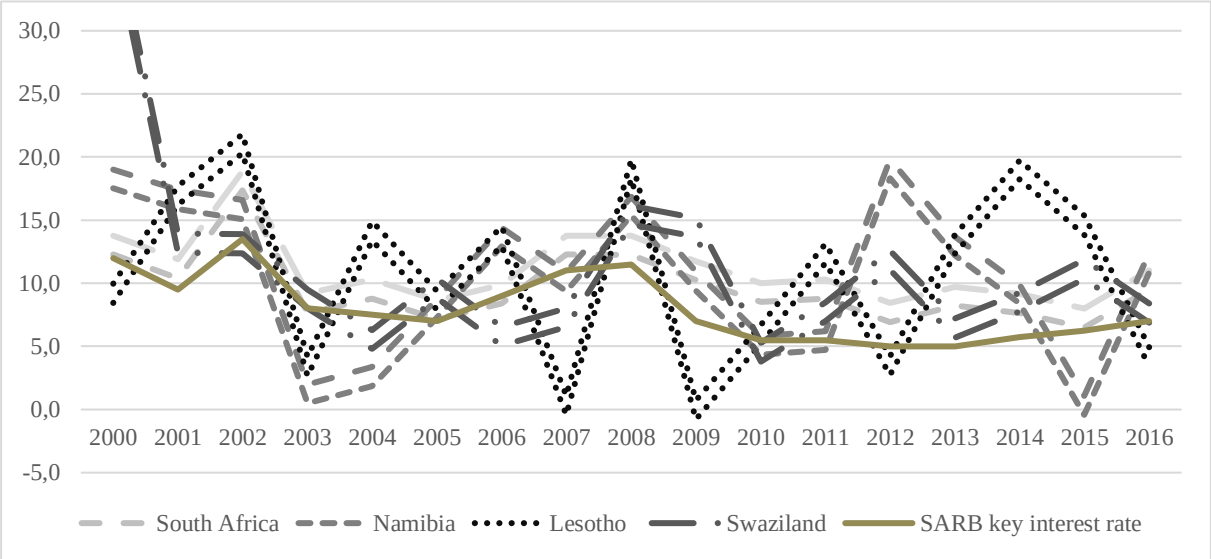

Figure 3: Taylor Rule-predicted central bank interest rate and SARV key interest rate

Source: International Financial Statistics, IMF (2018); World Development Indicators, World Bank (2018).

The average differences of the Taylor Rule-calculated optimal interest rate for each economy and the SARB key interest rate are displayed in table 4. The average over the whole period 2000-2016 is considered, as well as the period up to the beginning of the financial crisis and the period after 2008. Over the whole period, South Africa's Taylor Rule results deviate the least from the SARB's key interest rate; the lower bound deviates by 1.7 percentage points and the upper bound deviates by 3.1 percentage points. Namibia and Swaziland have higher differentials in the range between 4.0 and 4.9 percentage points, while Lesotho has a significant differential of 5.8 percentage points to the lower bound and 6.2 percentage points to the upper bound. Both in the period before and after 2008 the South African Taylor Rule-predicted interest rate has the lowest differential to the SARB key interest rate. However, in the period 2000-2008 the differential is much smaller than in the period 2009-2016, a range of 0.1 to 2.3 percentage points in the first period compared to 2.4 to 3.9 percentage points in the second period. In the period before 2008, Namibia's Taylor Rule calculated interest rate is second-closest to the SARB's key interest rate (4.0 to 4.5 percentage points) but much larger than the South African one. It is followed by Swaziland (5.0 to 5.3 percentage points) and Lesotho (5.7 to 6.2 percentage points). In the period after 2008, the order is reversed. Swaziland's Taylor Rule-calculated interest rate only deviates slightly more from the key interest rate than the South African one does (2.9 to 4.0 percentage points). It is followed by

Namibia (4.8 to 5.4 percentage points) and Lesotho (5.9 to 6.2 percentage points) whose Taylor Rule results deviate much stronger from the SARB's key interest rate.

Table 4: Average difference of Taylor Rule interest rate and SARB key interest rate

	South Africa		**Namibia**		**Lesotho**		**Swaziland**	
average difference	upper bound	lower bound	upper bound	lower bound	upper bound	lower bound	upper bound	lower bound
2000-2016	3.1	1.7	4.9	4.4	6.2	5.8	4.7	4.0
2000-2008	2.3	0.1	4.5	4.0	6.2	5.7	5.3	5.0
2009-2016	3.9	2.4	5.4	4.8	6.2	5.9	4.0	2.9

To sum up, the differential between the Taylor Rule interest rate and the SARB key interest rate for South Africa, Namibia and Lesotho was smaller in the period before 2008, while it was smaller in the period 2009-2016 for Swaziland. The on average higher differential may be due to the more volatile economic environment after the financial crisis, which made it more difficult for the SARB to set a foresighted monetary policy. The differential was smallest for South Africa in each period and over the whole period from 2000 to 2016. It was much smaller than for the other CMA economies and in the period 2000-2008 the SARB's policy key interest rate follows almost exactly the lower-bound Taylor Rule for the South African economy. The SARB appears to be biased considering mainly the South African economy when setting the monetary policy for the whole CMA area. It does not seem to consider the macroeconomic situation in the small member economies when deciding on which interest to set. This bears considerable costs for Namibia, Lesotho, and Swaziland since the economies are not balanced by an appropriate monetary policy, and economic fluctuations move quite asymmetrically with the South African economy.

Johansson and Ljungberg (2013) find an average difference of more than 5 percentage points between the maximum ECB Rule in each year and the ECB interest rate. When comparing these numbers to the results on the CMA, the maximum deviation of the Taylor Rule results in the CMA is much more pronounced with 15.0 percentage points at the lower bound and 16.1 percentage points at the upper bound. The SARB is no common central bank for the whole CMA area, as the ECB is supposed to be by design for the Eurozone.

Unbalanced boom and bust cycles of economies in monetary unions can have a negative impact on growth and the income convergence inside the monetary union (Johansson & Ljungberg, 2013). Franks et al. (2018) find that no real convergence has occurred among the founding Eurozone economies since the introduction of the Euro. The gap between per capita income levels has not closed. Has the biased monetary policy of the SARB had a similar impact on income convergence in the CMA?

Figure 4 plots average annual per capita GDP growth between 1981 and 2016 against per capita GDP in 1981. The relationship between those indicators is negative. Lesotho and Swaziland were very poor in 1981, but they experienced the on average highest annual per capita GDP growth. South Africa was richest in 1981, but per capita growth was slowest of the CMA economies. It can be concluded that the biased monetary policy by the SARB did not strongly impede income convergence.

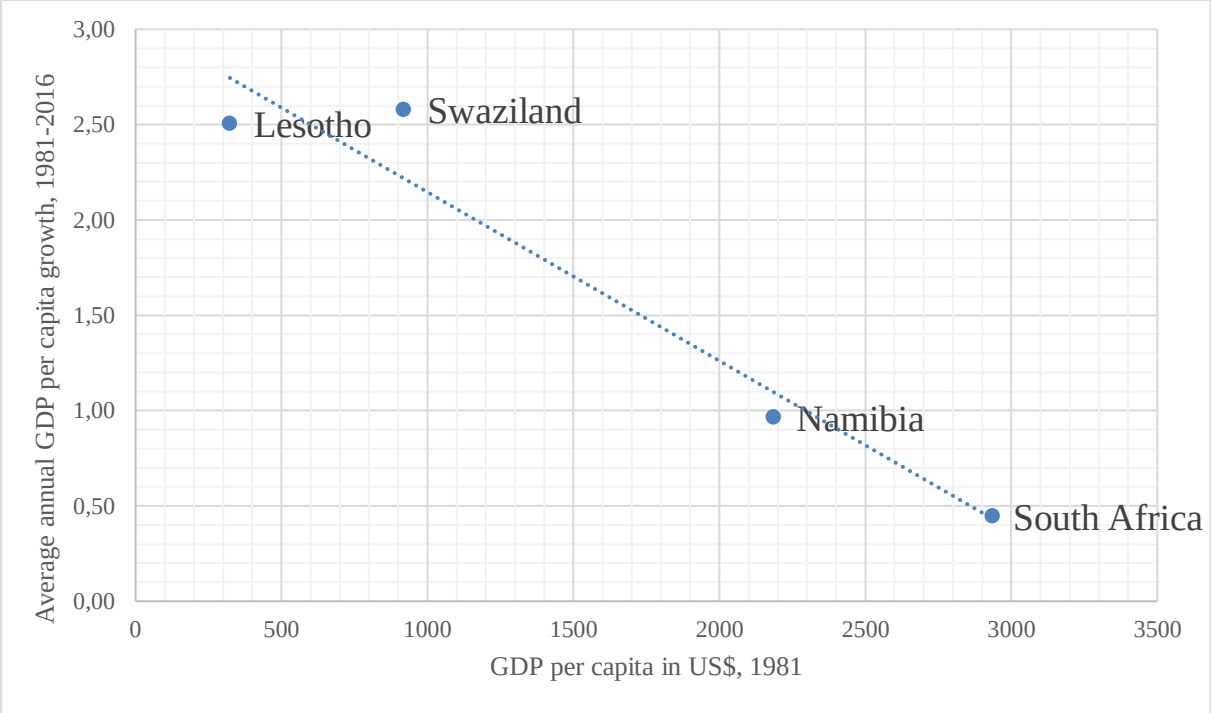

Figure 4: Income convergence in the CMA, 1981-2016
Source: World Development Indicators, World Bank (2018).

5.2 Anti-inflationary credibility and government debt

Gains for the small CMA economies arise from the anti-inflationary credibility of the SARB which stabilizes the macroeconomic environment in the CMA area. The reputation of the SARB is the one of an independent well-governed institution (Omarjee, 2018; Tavlas, 2009). Aron and Muellbauer (2007) observe strong growth in the accountability and transparency of monetary policy since the 1990s. Since the practice of inflation targeting was introduced in 2000, credibility and predictability of monetary policy have increased. Moreover, the SARB considers the inflation target more important than managing the output gap (Aron & Muellbauer, 2002). The small CMA members profit from the credible reputation of the SARB. Masson and Pattillo (2004) calculate that the benefits from the SARB with the strong reputation are higher than they would be from a common symmetric central bank in which all CMA members had an equal say. Stronger voices from Namibia, Lesotho, and Swaziland would probably dilute the anti-inflationary policy as it is the case in neighbouring economies in the southern African region.

Figure 5 shows the inflation rate of the CMA members and other economies in the region since 1961. While also in some CMA economies periods of higher volatility and high inflation rates occurred, those are not comparable with the fluctuations of neighbouring economies and the massive money growth some of them experienced in times of hyperinflation. Namely, Zimbabwe, Angola, Malawi, Mozambique, and Zambia went through periods of annual inflation rates of much above 40% between 1985 and 2010. The average inflation of the CMA economies increased from a low level in the 1960s to stronger fluctuating rates above 10% in the 1970s and 1980s. From the beginning of the 1990s, inflation decreased again and remained under 10% since the mid-2000s. Botswana's inflation rate moved closely with the CMA average, even after Botswana opted out of the CMA in 1975. However, the case of Botswana is special due to its strong, accountable and democratic institutions. No other economy in the region outside of the CMA managed to maintain an inflation rate as low and stable.

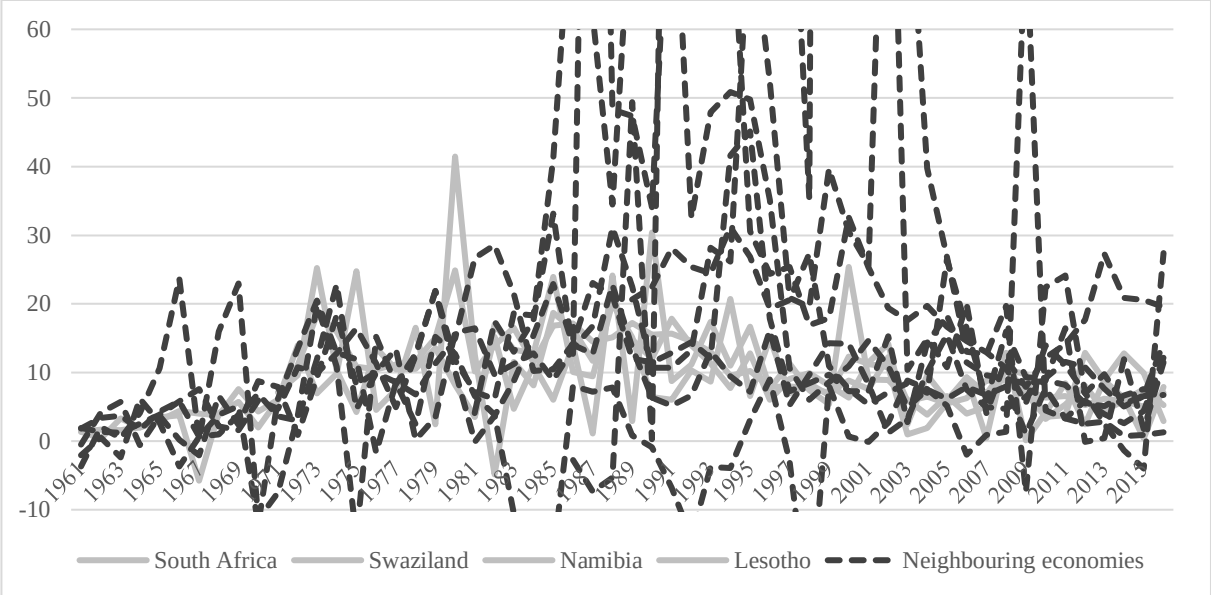

Figure 5: Annual inflation (GDP deflator) of CMA members and neighbouring economies, 1961-2016*

**Neighbouring economies include Angola, Malawi, Zimbabwe, Zambia, Madagascar, Mozambique Tanzania and Botswana.*

Source: World Development Indicators, World Bank Database (2018).

Apart from creating a stable macroeconomic environment, a steady and low inflation rate originating from an anti-inflationary central bank with a credible reputation has further benefits. With an independent central bank, governments cannot tax away their debt using higher inflation. Instead, they need to maintain healthy budgets and sustainable debt levels. This leads to lower interest on government bonds since the risk of default is lower. Figure 6 shows that the CMA economies profit from low government bond interest rates when compared to neighbouring economies. The governments need to spend less on servicing their debt. More money remains for investments as, for instance, into the health and education sector which supports the development of the economy.

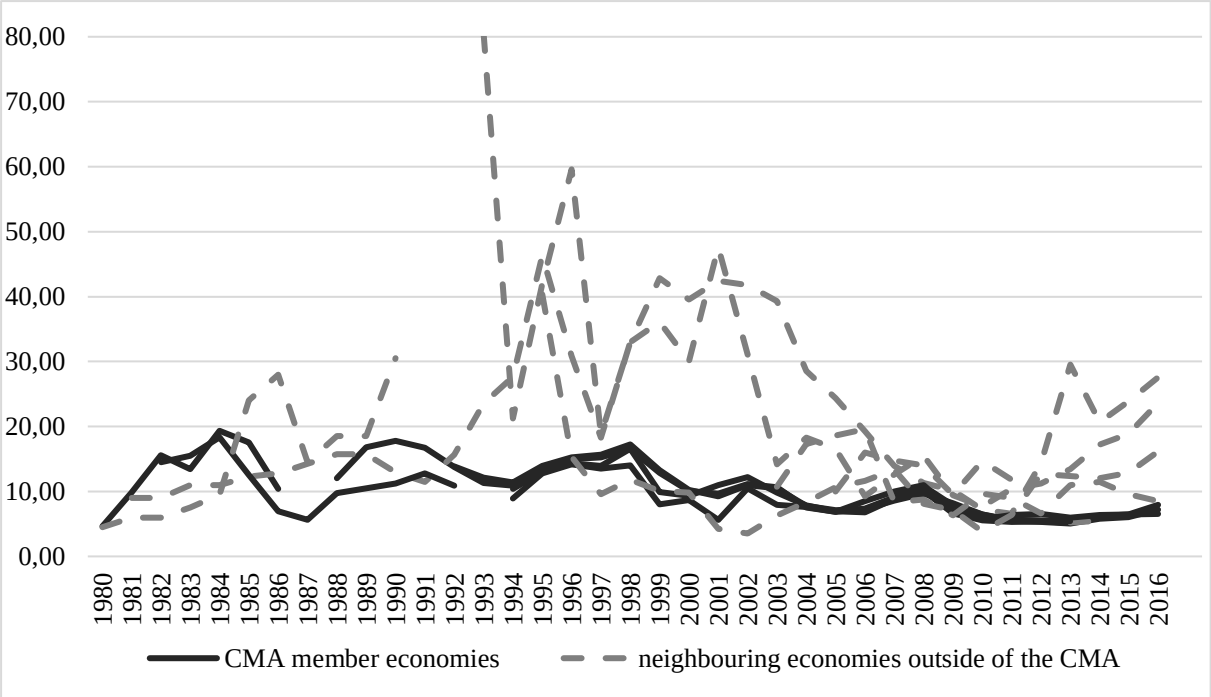

Figure 6: Government bond interest rates, 1980-2016
Source: International Financial Statistics, IMF (2018).
Neighbouring economies outside the CMA include Mozambique, Tanzania, Zambia and Madagascar.

5.3 Original sin

Many developing economies face the problem of "original sin" when they have to borrow in foreign currencies since investors do not trust small volatile currencies (Fritz & Muhlich, 2010). In those cases, countries are not insured against terms of trade shocks that may come with strong capital outflows. With a substantial depreciation of the domestic currency, the debt burden increases dramatically so that some debtor countries are not able to continue servicing their debt. Capital outflows are especially predominant if the trust of foreign investors in the currency and the country is low. Caballero et al. (2005) reason that trust in the currency depends on how credible and clear the policy framework on monetary policy and the exchange rate is. Investors need to believe that the central bank can and will balance shocks to avoid large exchange rate movements so that investors are not expropriated of their investments. Country-trust is established with a clear default history and a sound independent institutional set-up.

The Rand has proven to be a relatively trustworthy currency which is traded in larger volumes. By using the Rand, Namibia, Lesotho, and Swaziland circumvent the necessity of proving their currency and country trustworthy to foreign investors, a tricky problem which most developing economies face and fail on. They adopt not only the higher currency-trust from the independent, credible SARB policy but also the country-trust in the relatively sound South African institutions while it would be much harder to convince foreign investors to trust and invest in the Namibian dollar, the Swazi lilangeni or the Basotho loti. The risk of default

is decreased immensely by avoiding the original sin problem which is a further explanation for the spread of the government debt interest between the economies of the Rand area and neighbouring economies in figure 6. Small currencies such as the Zambian Kwacha or the Angolan Kwanza are seen as much more prone to the problem of original sin and are consequently riskier than the Rand. The possibility to take on debt in their domestic currency and thereby reducing the risk of an increase in the debt burden is a definite advantage of using the Rand for the small CMA economies.

5.4 The Impossible Trinity trade-off

An alternative to using the Rand for the small CMA economies is to leave the peg. A trade-off emerges that can be explained by the principle of the Impossible Trinity. The Impossible Trinity describes the concept that an economy cannot at the same time maintain a fixed exchange rate, conduct an independent monetary policy and allow capital flows to move freely across borders. If the domestic interest rate set by the central bank deviates from interest rates of major global currencies, depreciation or appreciation pressure will be exerted on the domestic currency since investors will want to take advantage of the opportunity to arbitrage. With free movement of capital across borders, the central bank will have to prevent a depreciation or appreciation of the domestic currency. If the pressure of depreciation is too strong, the central bank will run out of foreign reserves and must let the exchange rate float. Then, the fixed exchange rate cannot be maintained. Contrarily, if the central bank wants to defend the peg, it must adjust the domestic money market rate so that monetary policy cannot be conducted autonomously.

Nowadays in a globalized world with large trade flows, capital controls are difficult to maintain. Additionally, they can impose large distortions, which affects the working of the market economy. Consequently, it usually comes down to deciding between an autonomous monetary policy which can balance booms and busts, make the economy run less volatile and avoid major disruptions or a fixed exchange rate which regulates fluctuations between currencies so that international trade flows are not interrupted by a volatile exchange rate. The latter option is especially valuable for economies which trade a lot.

Namibia, Lesotho, and Swaziland face the trade-off of either staying with using the Rand and thereby remaining with a low-inflation stable currency and a fixed exchange rate inside the CMA which fosters trust in the institutions and further economic integration with South Africa and other members that remain in the agreement. Alternatively, they could abandon the peg to the Rand. Then, they would either let their domestic currencies float against all other currencies or peg to another global currency.

The option of staying with the Rand means to sacrifice the ability to pursue an own independent monetary policy and not to be able to balance cyclical fluctuations. Also, the Rand fluctuates quite volatile against other major currencies such as the Euro, Dollar, and Renminbi which are used by the CMA’s largest trading partners, and the South African

currency has depreciated gradually since the 1980s. However, being able to conduct independent monetary policy is not the only instrument to balance the economy. The small members could also profit from a floating Rand against the outside of the CMA that renders exports more or less expensive and thereby balances the economy through the external component of GDP. However, this works only in favour of the Namibian, Basotho, and Swazi economies if their business cycles move in line with the South African economy. The common exchange rate will rise when South Africa is booming which will render exports by all Rand economies more expensive. This will be beneficial for the small members when they are in a boom, as well, but will exacerbate recessions. Since the analysis found the South African business cycle to move countercyclically against the other CMA economies, exchange rate movements likely do not operate to balance the small member economies.

The contrary option would be to abandon the peg and the use of the Rand. Then, the small CMA economies could either peg their domestic currencies against another global currency or float their domestic currencies against all other currencies. The first option would only be beneficial if trade with the US, the Eurozone or China was extensive. Since South Africa is the largest trading partner for Namibia, Lesotho, and Swaziland, no additional gains would arise from this. The latter option of floating would provide the ability to pursue an independent monetary policy. However, the institutional set-up might be prone to higher inflation. The currently healthy state of the government budget would likely deteriorate, and the economies would have to deal with the problem of original sin which would increase the interest on government debt. Considering the alternatives, Namibia, Lesotho, and Swaziland are well advised to stay within the CMA agreement.

In conclusion, the weighting of costs and benefits of the institutional setup and the operation of monetary and fiscal institutions is a trade-off. Gains arise from adopting the anti-inflationary credible monetary policy which stabilizes the macroeconomic environment and the government budget, and the possibility to take on debt in the domestic currency. Losses exist due to the South African bias of the SARB which may unbalance the smaller CMA members' economies on the other hand. However, when comparing the actual institutional design to alternative settings the gains seem to prevail if independent monetary policy is not considered to be inherent for sustainable development.

6 Conclusion

This thesis set out to evaluate the costs and benefits and their evolution over time arising from the CMA for the small member economies and to examine whether the agreement is conducive to economic development. To do so, the thesis analysed the symmetry of economic shocks in the area and the extent of intra-CMA trade. Moreover, the SARB's monetary policy and the institutional setup were investigated, and its positive and negative impacts on the Namibian, Basotho and Swazi economies were studied.

No endogeneity of the optimality of the CMA as a monetary union was found. The analysis did not detect a common currency trade-creating effect inside the CMA; benefits from trade are low for the member economies. Economic shocks were found to hit asymmetrically inside the CMA area, and they have not become more symmetric over time. This bears high costs. The small CMA members are found to be severely affected by this since a bias in the SARB's monetary policy towards the South African economy was detected. This means that the small economies' boom and bust cycles are not balanced or may even be aggravated which obstructs income convergence inside the monetary union. However, income convergence inside the CMA is not found to be seriously affected. Benefits for Namibia, Lesotho, and Swaziland originate from the adopted low-inflation monetary policy by the SARB which results in lower government debt interest payments. Additionally, the possibility of taking on debt in the domestic currency reduces the risk of an exponential increase in debt due to volatile terms of trade.

Limitations to the results of the analysis arise from low data availability. The endogeneity issue would have been interesting to further investigate from the creation of the monetary agreement on, more than a hundred years ago. However, GDP data are only available since 1960. Specifically, the analysis of intra-CMA trade is constrained by an incomplete dataset covering the time since 2000. Better coverage and data reaching further back would improve the quality and validity of the results. Furthermore, the reasoning on how the operating of institutions affects the member economies positively and negatively is mostly qualitative, backed with only a few numbers. For instance, numbers on how much of national debt is taken on in Rand versus how much is taken on in other currencies by Namibia, Lesotho, and Swaziland would support the analysis but are not available. The calculation of the Taylor Rule-optimal interest rates of the CMA economies is somewhat imprecise. The assumed weighting between the output gap and stable inflation could lead to inaccuracies. Additionally, the long-term interest rate is proxied by a rule of thumb.

When comparing the results from the analysis to earlier findings on the Eurozone, substantial differences become apparent. In the CMA, the individual domestic component of economic

shocks is much higher than in the Eurozone. Contrarily, in the Eurozone, either the regional or global component is quite high for each economy, even for peripheral countries. While for the CMA economies no trade-enhancing effect of using the same currency is observable, intra-Eurozone trade is intensive which economists trace back to the introduction of the common market in 1993 and the Euro in 1999 (Eichengreen, 2008; Baldwin, 2006). When considering traditional measures of costs and benefits and the endogeneity question, the CMA fails in providing significant benefits, while the costs prevail.

However, when turning towards non-traditional measures of benefits and costs, such as the operation of institutions, benefits arise for the small economies in the CMA. The asymmetric design of the agreement brings both advantages and disadvantages. If a determined monetary policy that balances booms and busts is considered the crucial factor for an economy's development, the disadvantages prevail. Contrarily, if stable inflation and low costs of borrowing are weighted as more important, the benefits will outweigh the costs. It can be concluded that traditional OCA and monetary unions research neglects certain aspects that present relevant benefits and costs for developing economies. This means that a weighting of traditionally considered benefits and costs measures can come to a different uninformed conclusion about the net gains of monetary unification for a group of developing economies. In future research in this area, new measures will have to be developed and considered for a comprehensive analysis to determine if monetary unification should be considered a successful development policy.

The institutional design of the CMA has grown organically due to historical pre-conditions over the years, contrasting with agreements such as the Eurozone which was designed on paper. Can the institutional set-up of the CMA be a role model for other developing regions? The setting is unique, and several characteristics of the arrangement play together in making it profitable for the small members to stay in the monetary union. The Rand is a large currency that investors are relatively comfortable to invest in. Additionally, the central bank that controls the currency is credible about its future monetary policy strategy. South Africa is a large emerging economy that is slightly further developed than Namibia, Lesotho, and Swaziland are. Those criteria are linked in their effects and may play out differently when applied to another region with different political and economic relations between the economies. Consequently, the institutional design is not directly transferrable but suggestions for other monetary unification projects may be derived.

References

Aron, J. & Muellbauer, J. (2002).Estimating Monetary Policy Rules for South Africa, *Central Banking, Analysis, and Economic Policies Book Series,*vol.4,no.427-476.

Aron, J. & Muellbauer, J. (2007).Review of Monetary Policy in South Africa since 1994, *Journal of African Economies,*vol.16,no.5**,** pp 705-744.

Asonuma, M. T., Debrun, M. X. & Masson, M. P. R. (2012). Welfare Effects of Monetary Integration: The Common Monetary Area and Beyond: International Monetary Fund.

Baldwin, R. E. (2006).The Euro's Trade Effects,

Bashar, O. H. (2011).On the Permanent Effect of an Aggregate Demand Shock: Evidence from the G-7 Countries, *Economic modelling,*vol.28,no.3**,** pp 1374-1382.

Bayoumi, T. & Ostry, J. D. (1997).Macroeconomic Shocks and Trade Flows within Sub-Saharan Africa: Implications for Optimum Currency Arrangements, *Journal of African economies,*vol.6,no.3**,** pp 412-444.

Buigut, S. K. & Valev, N. T. (2006).Eastern and Southern Africa Monetary Integration: A Structural Vector Autoregression Analysis, *Review of Development Economics,*vol.10,no.4**,** pp 586-603.

Caballero, R. J., Cowan, K. & Kearns, J. (2005).Fear of Sudden Stops: Lessons from Australia and Chile, *The Journal of Policy Reform,*vol.8,no.4**,** pp 313-354.

Chow, H. K. & Kim, Y. (2003).A Common Currency Peg in East Asia? Perspectives from Western Europe, *Journal of Macroeconomics,*vol.25,no.3**,** pp 331-350.

Cobham, D. & Robson, P. (1994).Monetary Integration in Africa: A Deliberately European Perspective, *World Development,*vol.22,no.3**,** pp 285-299.

Collings, F. d. A. (1978).The Rand and the Monetary Systems of Botswana, Lesotho, and Swaziland, *The Journal of Modern African Studies,*vol.16,no.1**,** pp 97-121.

De Grauwe, P. (2007).On Monetary and Political Union, *Key challenges to the global system,*vol.1000-1007.

De Grauwe, P. (2013a).Design Failures in the Eurozone: Can They Be Fixed?,

De Grauwe, P. (2013b).The Political Economy of the Euro, *Annual review of political science*,vol.16,no.153-170.

De Grauwe, P. (2018). Economics of Monetary Union: Oxford university press.

De Grauwe, P. & Mongelli, F. P. (2005).Endogeneities of Optimum Currency Areas: What Brings Countries Sharing a Single Currency Closer Together?,

Debrun, X. & Masson, P. R. (2013).Modelling Monetary Union in Southern Africa: Welfare Evaluation for the Cma and Sadc, *South African Journal of Economics*,vol.81,no.2**,** pp 275-291.

Debrun, X., Masson, P. R. & Pattillo, C. (2011).Should African Monetary Unions Be Expanded? An Empirical Investigation of the Scope for Monetary Integration in Sub-Saharan Africa, *Journal of African economies*,vol.20,no.suppl_2**,** pp ii104-ii150.

Dlamini, D. F. (2014).Convergence and Asymmetries in the Common Monetary Area in Southern Africa, *Published by the University of Swaziland VOLUME 27, March 2014 SPECIAL EDITION*,vol.27,no.100-118.

EC Commission (1990).One Market, One Money, *European Economy*,vol.44,no.68.

EC Community. (1992). Maastricht Treaty.

Eichengreen, B. (2008). The European Economy since 1945: Coordinated Capitalism and Beyond: Princeton University Press.

Eichengreen, B. J. (1992). Should the Maastricht Treaty Be Saved?: International Finance Section, Department of Economics, Princeton University Princeton.

Feldstein, M. (2012).The Failure of the Euro, *Foreign Affairs*,vol.91,no.1**,** pp 105-116.

Frankel, J. A. & Rose, A. K. (1998).The Endogenity of the Optimum Currency Area Criteria, *The Economic Journal*,vol.108,no.449**,** pp 1009-1025.

Franks, M. J. R., Barkbu, M. B. B., Blavy, M. R., Oman, W. & Schoelermann, H. (2018). Economic Convergence in the Euro Area: Coming Together or Drifting Apart?: International Monetary Fund.

Fritz, B. & Muhlich, L. (2010).South-South Monetary Integration: The Case for a Research Framework Beyond the Theory of Optimum Currency Area, *International Journal of Public Policy*,vol.6,no.1-2**,** pp 118-135.

Grandes, M. (2003).Macroeconomic Convergence in Southern Africa,

Grech, A. G. (2014).Investigating Potential Output Using the Hodrick-Prescott Filter: An Application for Malta,

Hall, P. A. (2014).Varieties of Capitalism and the Euro Crisis, *West European Politics*,vol.37,no.6**,** pp 1223-1243.

Jefferis, K. R. (2007).The Process of Monetary Integration in the Sadc Region, *Journal of Southern African Studies*,vol.33,no.1**,** pp 83-106.

Jerven, M. & Johnston, D. (2015).Statistical Tragedy in Africa? Evaluating the Data Base for African Economic Development, *The Journal of Development Studies*,vol.51,no.2**,** pp 111-115.

Johansson, T. & Ljungberg, J. (2013).Asymmetric Trends and European Monetary Policy in the Post-Bretton Woods Era, *Lund Papers in Economic History*,vol.128,no.

Kenen, P. (1969).The Theory of Optimum Currency Areas,

Kerner, A., Jerven, M. & Beatty, A. (2017).Does It Pay to Be Poor? Testing for Systematically Underreported Gni Estimates, *The Review of International Organizations*,vol.12,no.1**,** pp 1-38.

Kronberger, R. (2002).A Cost Benefit Analysis of a Monetary Union for Mercosur with Particular Emphasis on the Optimum Currency Area Theory?, *Integration and Trade*,vol.6,no.29-93.

Krugman, P. (2001).Lessons of Massachusetts for Emu', *INTERNATIONAL LIBRARY OF CRITICAL WRITINGS IN ECONOMICS*,vol.134,no.41-61.

Krugman, P. (2013).Revenge of the Optimum Currency Area, *NBER Macroeconomics Annual*,vol.27,no.1**,** pp 439-448.

Maruping, M. (2005).Challenges for Regional Integration in Sub-Saharan Africa: Macroeconomic Convergence and Monetary Coordination, *Africa in the World Economy: The National, Regional and International Challenges (FONDAD The Hague 2005)*,vol.129-155.

Masha, I., Harris, L., Wang, J.-Y. & Shirono, K. (2007). The Common Monetary Area in Southern Africa: Shocks, Adjustment, and Policy Challenges: International Monetary Fund.

Masson, P. R. & Pattillo, C. (2004). The Monetary Geography of Africa: Brookings Institution Press.

McKinnon, R. I. (1963).Optimum Currency Areas, *The American Economic Review,*vol.717-725.

McKinnon, R. I. (1988).Monetary and Exchange Rate Policies for International Financial Stability: A Proposal, *The Journal of Economic Perspectives,*vol.2,no.1**,** pp 83-103.

Mpaki, B. (2016). Lesotho Inflation Tops Sacu Region. *Lesotho Times*.

Mundell, R. A. (1961).A Theory of Optimum Currency Areas, *The American economic review,*vol.51,no.4**,** pp 657-665.

Nielsen, H., Uanguta, E. & Ikhide, S. (2005).Financial Integration in the Common Monetary Area, *South African journal of economics,*vol.73,no.4**,** pp 710-721.

Nindi, A. G. (2012).The Feasibility of Monetary Integration within the Sadc Region, *Unpublished Thesis submitted in fulfillment of the requirements for the Degree of PhD, Submitted to Department of Economics & Economic History, Rhodes University,*vol.

North, D. C. (1991).Institutions, *Journal of economic perspectives,*vol.5,no.1**,** pp 97-112.

Nzimande, N. P. & Ngalawa, H. (2016). Is There a Sadc Business Cycle? Evidence from a Dynamic Factor Model,

Omarjee, L. (2018). Kganyago Wins Banking Award for Firm Stance on Sarb's Independence. *fin24.com*.

Radelet, S. (2010). Emerging Africa: How 17 Countries Are Leading the Way: Brookings Institution Press.

Ravn, M. O. & Uhlig, H. (2002).On Adjusting the Hodrick-Prescott Filter for the Frequency of Observations, *Review of economics and statistics,*vol.84,no.2**,** pp 371-376.

Robson, P. (1993).The New Regionalism and Developing Countries, *JCMS: Journal of Common Market Studies,*vol.31,no.3**,** pp 329-348.

Scharpf, F. W. (2011).Monetary Union, Fiscal Crisis and the Pre-Emption of Democracy, *Zeitschrift für Staats-und Europawissenschaften (ZSE)/Journal for Comparative Government and European Policy,*vol.163-198.

Schelkle, W. (2017). The Political Economy of Monetary Solidarity: Understanding the Euro Experiment: Oxford University Press.

Shaw, T. M. (2015).African Agency? Africa, South Africa and the Brics, *International Politics*,vol.52,no.2**,** pp 255-268.

Tavlas, G. S. (2009).The Benefits and Costs of Monetary Union in Southern Africa: A Critical Survey of the Literature, *Journal of Economic Surveys*,vol.23,no.1**,** pp 1-43.

Taylor, J. B. (Year) Published. Discretion Versus Policy Rules in Practice. Carnegie-Rochester conference series on public policy, 1993. Elsevier, 195-214.

van den Heever, J. (2010). External Use of the South African Rand. *Currency Internationalization: Global Experiences and Implications for the Renminbi.* Springer pp 42-55.

Van der Merwe, E. (2004). Inflation Targeting in South Africa: South African Reserve Bank Pretoria, South Africa.

Zhao, X. & Kim, Y. (2009).Is the Cfa Franc Zone an Optimum Currency Area?, *World Development*,vol.37,no.12**,** pp 1877-1886.

Appendix A

Table 5: Phillips-Perron Test in levels

Variable	Lags	Specification	Test Stat.	5% Crit. Value*	Conclusion	No. of observations
ln southafrica	1	Intercept, trend	-2.910	-3.494	Cannot reject H_0	56
ln namibia	1	Intercept, trend	-2.600	-3.556	Cannot reject H_0	36
ln lesotho	1	Intercept, trend	-2.470	-3.494	Cannot reject H_0	56
ln swaziland	1	Intercept, no trend	-2.420	-2.941	Cannot reject H_0	46
ln global1	1	Intercept, no trend	-2.306	-2.925	Cannot reject H_0	56

**H0: unit root*

Table 6: Augmented Dickey-Fuller Test in levels

Variable	Lags	Specification	Test Stat.	5% Crit. Value*	Conclusion	No. of observations
ln southafrica	1	Intercept, trend	-3.283	-3.495	Cannot reject H_0	55
ln namibia	0	Intercept, no trend	2.467	-2.969	Cannot reject H_0	36
ln lesotho	2	Intercept, no trend	-1.538	-2.927	Cannot reject H_0	54
ln swaziland	0	Intercept, no trend	-2.630	-2.941	Cannot reject H_0	46
ln global1	0	Intercept, no trend	-2.398	-2.925	Cannot reject H_0	56

**H0: unit root*

Table 7: Phillips-Perron Test in first differences

Variable	Lags	Specification	Test Stat.	5% Crit. Value*	Conclusion	No. of observations
d.ln southafrica	1	Intercept, no trend	-4.184	-2.926	Reject H_0	55
d.ln namibia	1	Intercept, trend	-5.159	-3.560	Reject H_0	35
d.ln lesotho	1	Intercept, no trend	-6.772	-2.926	Reject H_0	55
d.ln swaziland	1	Intercept, no trend	-5.053	-2.944	Reject H_0	45
d.ln global1	1	Intercept, no trend	-6.125	-2.926	Reject H_0	55

**H0: unit root*

Table 8: Augmented Dickey-Fuller Test in first differences

Variable	Lags	Specification	Test Stat.	5% Crit. Value*	Conclusion	No. of observations
d.ln southafrica	0	Intercept, no trend	-4.168	-2.926	Reject H_0	55
d.ln namibia	0	Intercept, no trend	-4.392	-2.972	Reject H_0	35
d.ln lesotho	9	Intercept, trend	-4.463	-3.516	Reject H_0	46
d.ln swaziland	0	Intercept, no trend	-5.039	-2.944	Reject H_0	45
d.ln global1	0	Intercept, no trend	-6.112	-2.926	Reject H_0	55

**H0: unit root*

Table 9: Phillips-Perron Test, subperiods in first differences

Variable	Lags	Specification	Test Stat.	5% Crit. Value*	Conclusion	No. of observations
d.ln southafrica						
1960-1990	1	Intercept, trend	-4.946	-3.584	Reject H_0	29
1970-2000	1	Intercept, no trend	-2.874	-2.992	Reject H_0	28
1987-2016	1	Intercept, no trend	-4.038	-2.989	Reject H_0	29
d.ln lesotho						
1960-1990	1	Intercept, no trend	-4.990	-2.989	Reject H_0	29
1987-2016	1	Intercept, no trend	-4.017	-2.992	Reject H_0	28
d.ln swaziland						
1970-2000	1	Intercept, no trend	-4.281	-2.989	Reject H_0	29
1987-2016	1	Intercept, no trend	-3.371	-2.992	Reject H_0	28
d.ln global1						
1960-1990	1	Intercept, no trend	-4.680	-2.989	Reject H_0	29
1970-2000	1	Intercept, no trend	-4.209	-2.989	Reject H_0	29
1987-2016	1	Intercept, no trend	-4.166	-2.992	Reject H_0	28

**H0: unit root*

Table 10: Augmented Dickey-Fuller Test, subperiods in first differences

Variable	Lags	Specification	Test Stat.	5% Crit. Value*	Conclusion	No. of observations
d.ln southafrica						
1960-1990	0	Intercept, no trend	-3.151	-2.989	Reject H_0	29
1970-2000	0	Intercept, no trend	-2.754	-2.992	Do not reject H_0	28
1987-2016	0	Intercept, no trend	-3.996	-2.989	Reject H_0	29
d.ln lesotho						
1960-1990	1	Intercept, no trend	-5.608	-2.992	Reject H_0	28
1987-2016	0	Intercept, no trend	-4.044	-2.992	Reject H_0	28
d.ln swaziland						
1970-2000	0	Intercept, no trend	-4.268	-2.989	Reject H_0	29
1987-2016	0	Intercept, no trend	-3.370	-2.992	Reject H_0	28
d.ln global1						
1960-1990	0	Intercept, no trend	-4.672	-2.989	Reject H_0	29
1970-2000	0	Intercept, no trend	-4.172	-2.989	Reject H_0	29
1987-2016	0	Intercept, no trend	-4.175	-2,992	Reject H_0	28

**H0: unit root*

Table 11: Forecast error variance decomposition, robustness check

	domestic component	regional component d.ln southafrica
Model 1		
d.ln namibia 1980-2016		
one year lagged	0.98	0.02
three years lagged	0.91	0.09
Model 2.1		
d.ln lesotho 1960-1990		
one year lagged	0.84	0.16
three years lagged	0.76	0.24
Model 2.2		
d.ln lesotho 1987-2016		
one year lagged	0.98	0.02
three years lagged	0.83	0.17
Model 3.1		
d.ln swaziland 1970-2000		
one year lagged	0.98	0.02
three years lagged	0.91	0.09
Model 3.2		
d.ln swaziland 1987-2016		
one year lagged	0.75	0.25
three years lagged	0.71	0.29

Appendix B

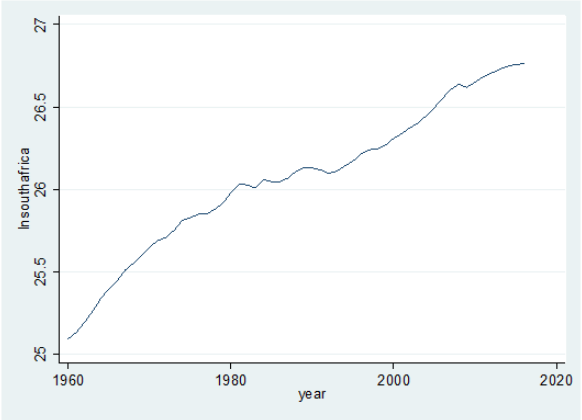

Figure 7: Log South Africa GDP, 1960-2016

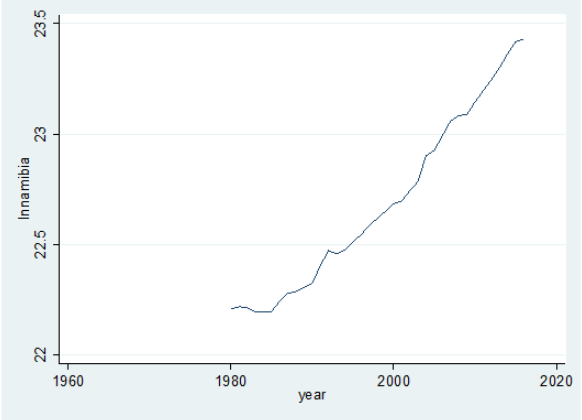

Figure 8: Log Namibia GDP, 1980-2016

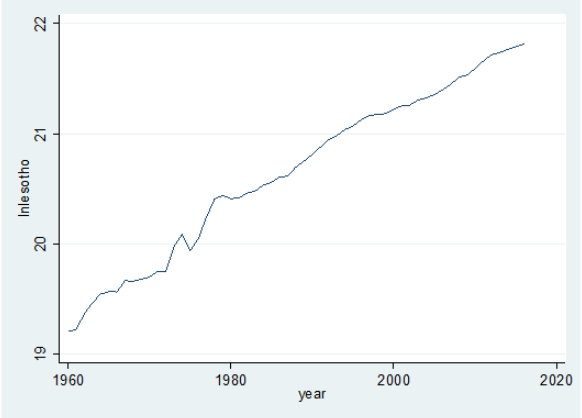

Figure 9: Log Lesotho GDP, 1960-2016

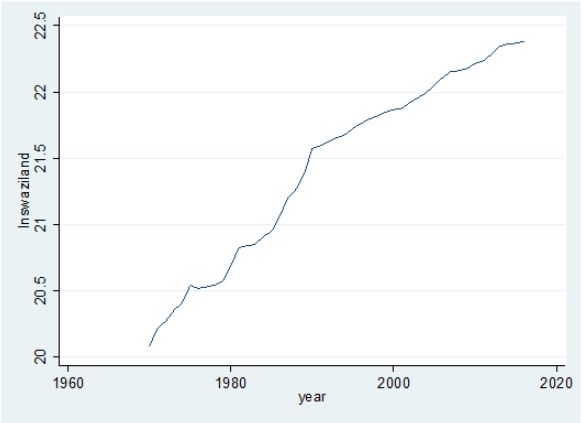

Figure 10: Log Swaziland GDP, 1970-2016

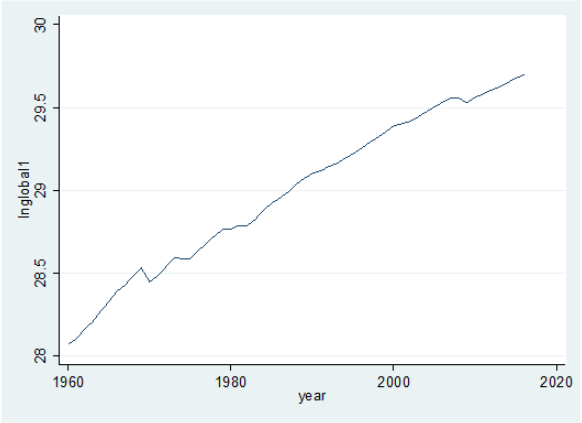

Figure 11: Log Gobal1 GDP, 1960-2016

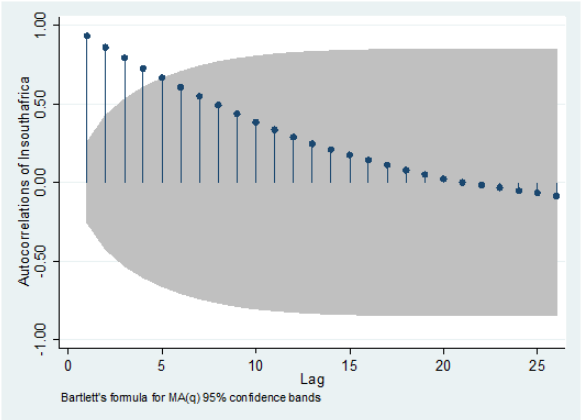

Figure 12: ACR Log South Africa, 1960-2016

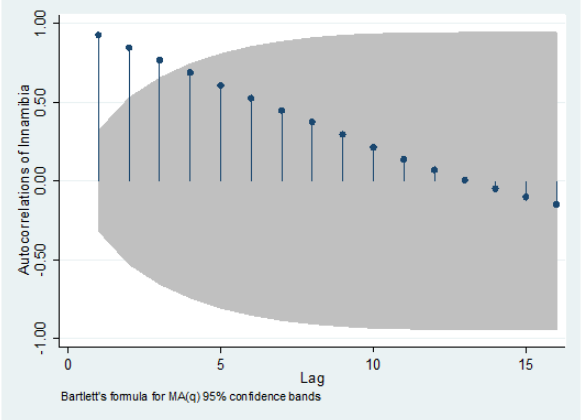

Figure 13: ACR Log Namibia GDP, 1980-2016

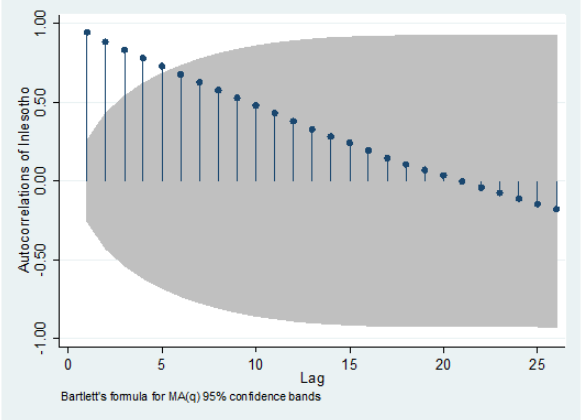

Figure 14: ACR Log Lesotho, 1960-2016

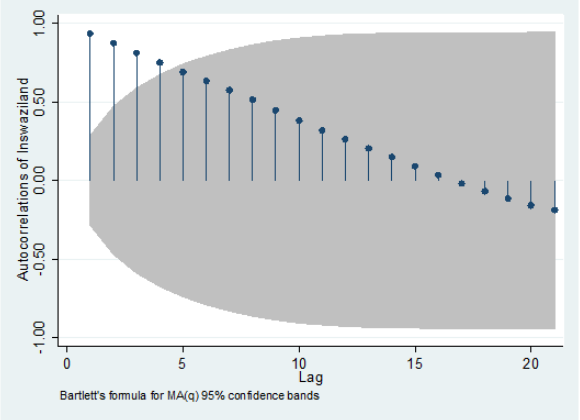

Figure 15: ACR Log Swaziland, 1970-2016

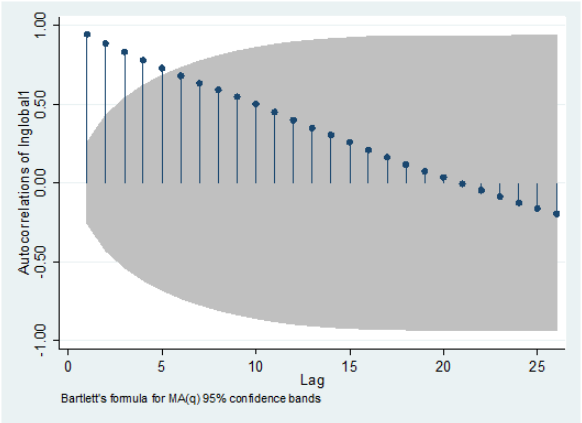

Figure 16: ACR Log Global1, 1960-2016

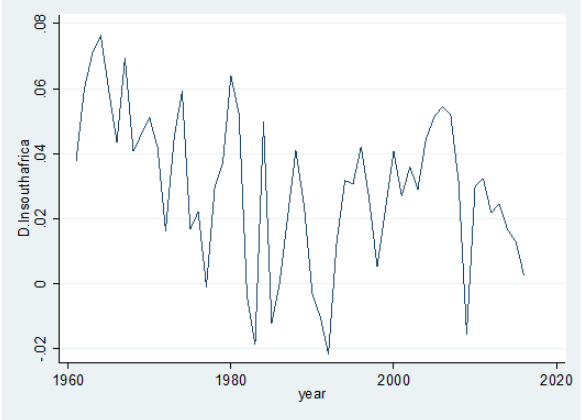

Figure 17: Diff. Log South Africa, 1960-2016

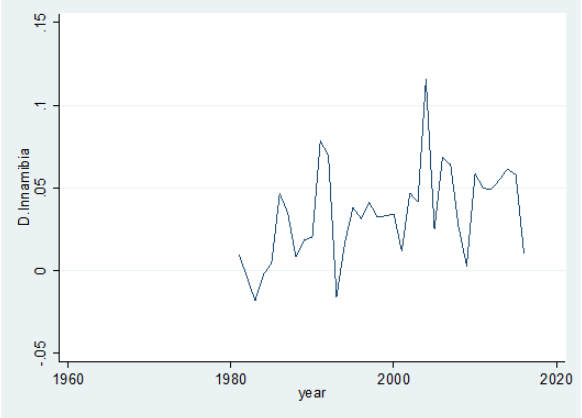

Figure 18: Diff. Log Namibia, 1980-2016

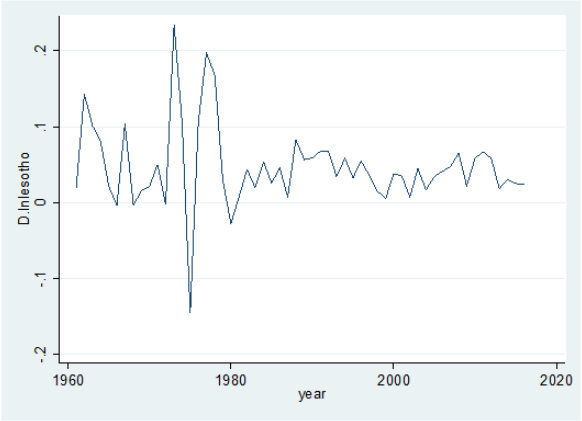

Figure 19: Diff. Log Lesotho, 1960-2016

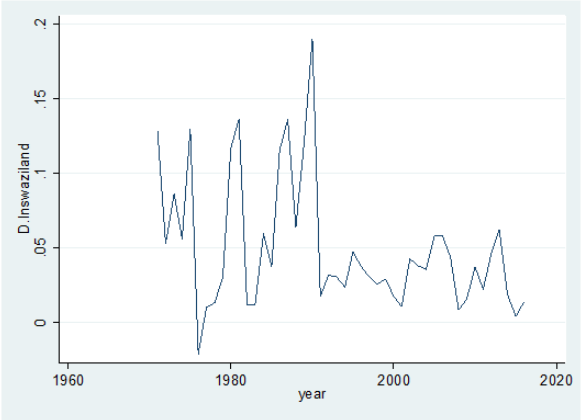

Figure 20: Diff. Log Swaziland, 1970-2016

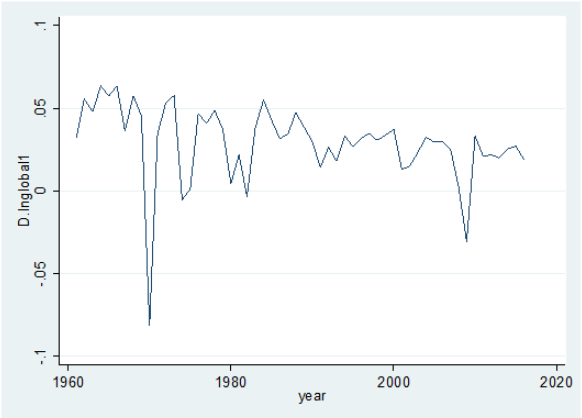

Figure 21: Diff. Log Global1, 1960-2016

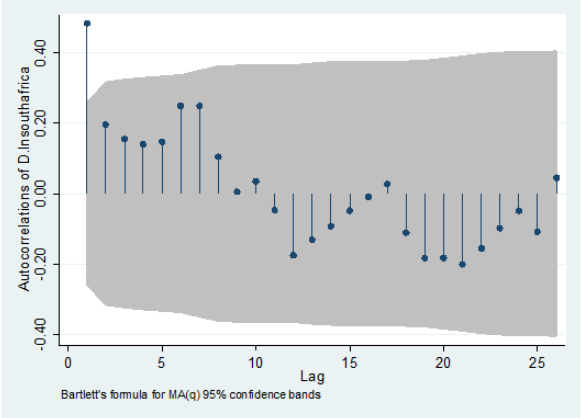

Figure 22: ACR Diff. Log South Africa, 1960-2016

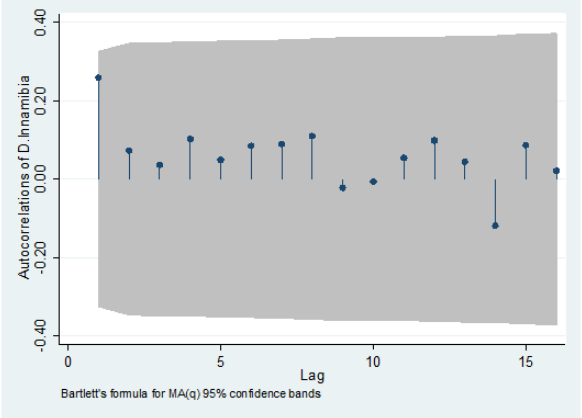

Figure 23: ACR Diff. Log Namibia, 1980-2016

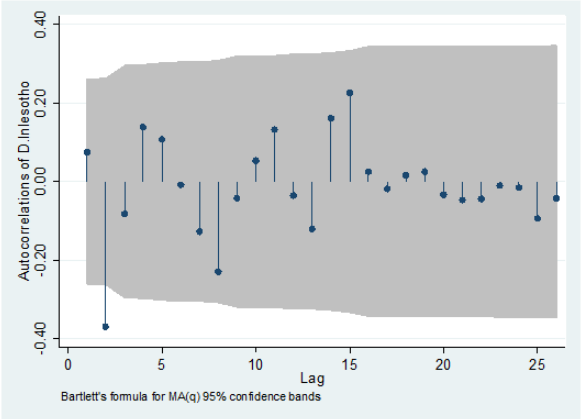

Figure 24: ACR Diff. Log Lesotho, 1960-2016

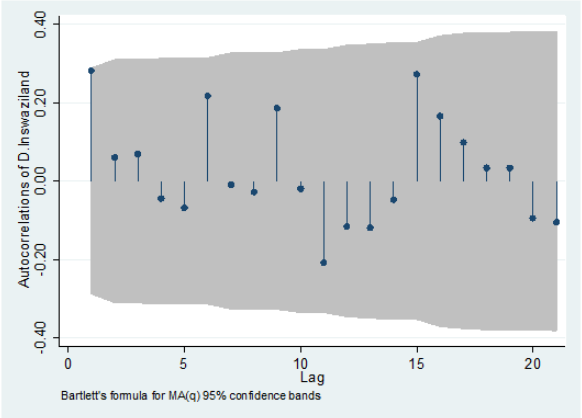

Figure 25: ACR Diff. Log Swaziland, 1970-2016

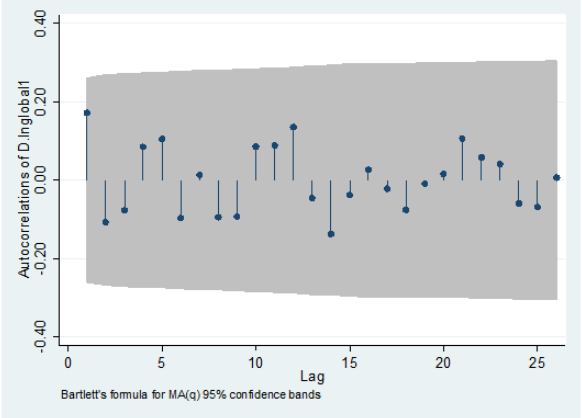

Figure 26: ACR Diff. Log Global1, 1960-2018

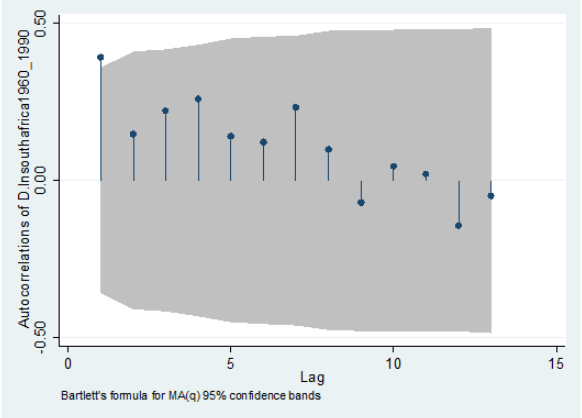

Figure 27: ACR Diff. Log South Africa, 1960-1990

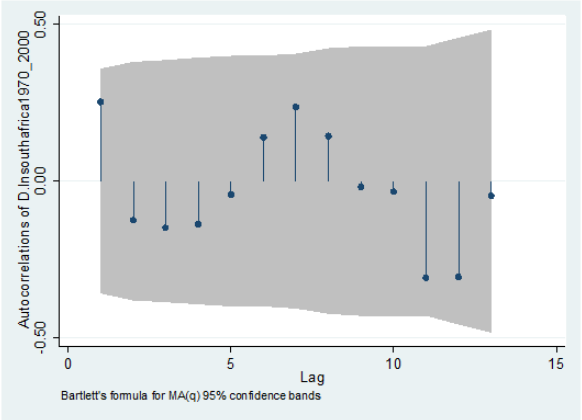

Figure 28: ACR Diff. Log South Africa, 1970-2000

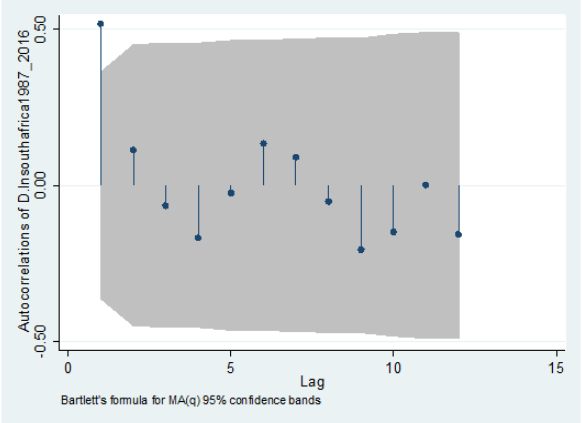

Figure 29: ACR Diff. Log South Africa, 1987-2016

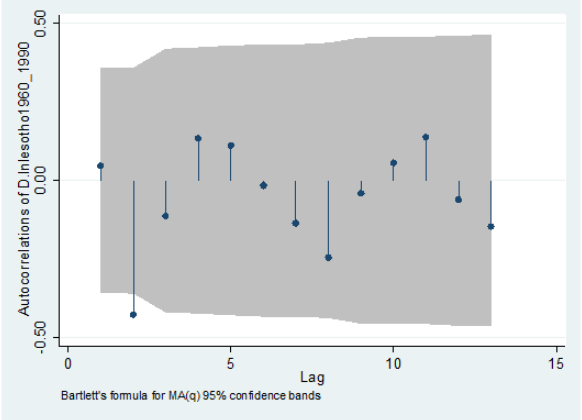

Figure 30: ACR Diff. Log Lesotho, 1960-1990

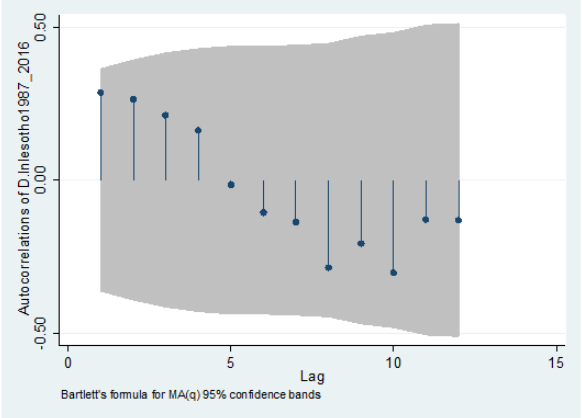

Figure 31: ACR Diff. Log Lesotho, 1987-2016

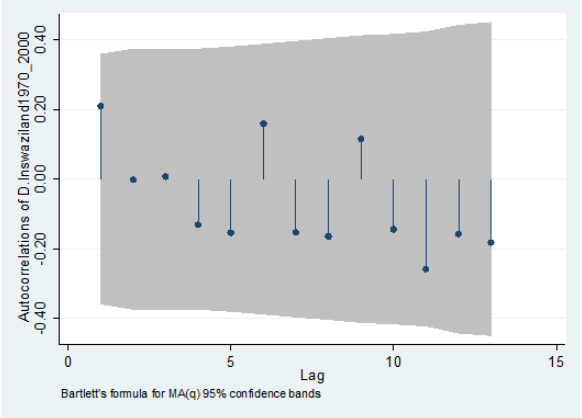

Figure 32: ACR Diff. Log Swaziland, 1970-2000

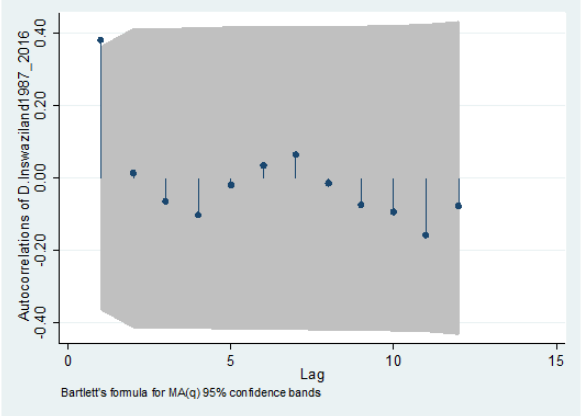

Figure 33: ACR Diff. Log Swaziland, 1987-2016

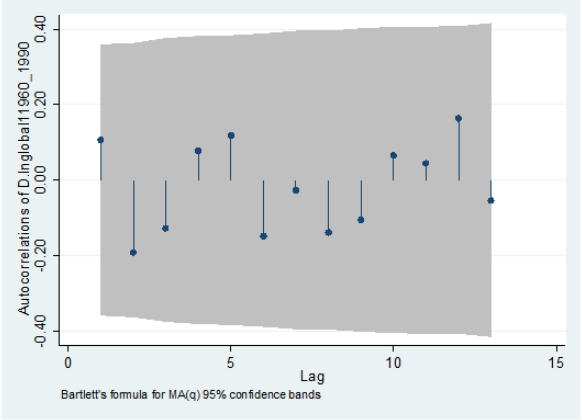

Figure 34: ACR Diff. Log Global1, 1960-1990

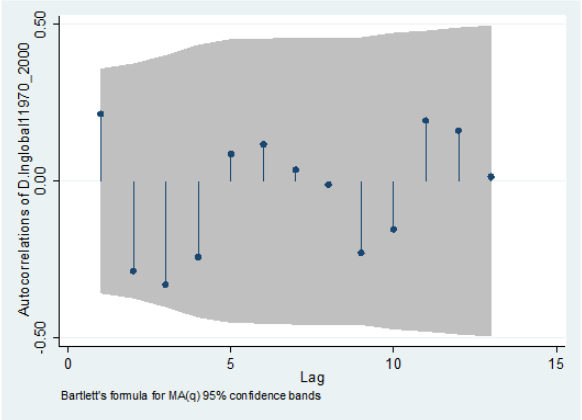

Figure 35: ACR Diff. Log Global1, 1970-2000

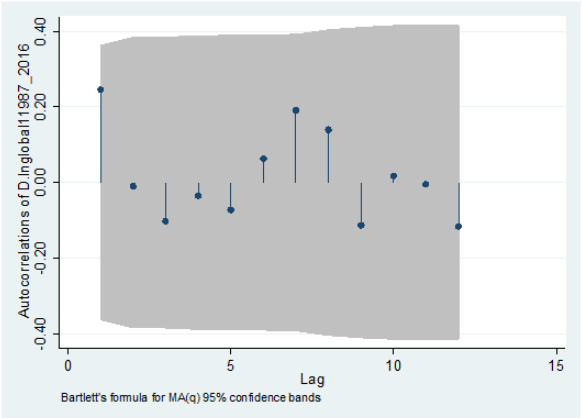

Figure 36: ACR Diff. Log Global1, 1987-2016

Appendix C

Table 12: Model 1, Selection order criteria

Lags	AIC	HQIC	SBIC
0	-15.1726	-15.1270	-15.0351
1	-15.4768*	-15.2946*	-14.9271*
2	-14.4179	-15.0991	-14.4560

**lag length suggested by information criterion.*

Table 13: Model 1, Jarque-Bera Test

Jarque-Bera Test	Prob > Chi2*
d.ln global1	0.0000
d.ln southafrica	0.4125
d.ln namibia	0.1700
ALL	0.0001
Skewness Test	
d.ln global1	0.0016
d.ln southafrica	0.6765
d.ln namibia	0.0660
ALL	0.0037
Kurtosis Test	
d.ln global1	0.0003
d.ln southafrica	0.2063
d.ln namibia	0.6861
ALL	0.0019

**H_0: Normal distribution of residuals.*

Table 14: Model 1, Lagrange Multiplier Test

Lags	Prob > Chi2*
1	0.5116
2	0.6223
3	0.5596

**H_0: No autocorrelation.*

Table 15: Model 2.1, Selection order criteria

Lags	AIC	HQIC	SBIC
0	-11.0077*	-10.9659*	-10.8626*
1	-10.7343	-10.5670	-10.1536
2	-10.6362	-10.3436	-9.6201

**lag length suggested by information criterion.*

Table 16: Model 2.1, Jarque-Bera Test

Jarque-Bera Test	Prob > Chi2*
d.ln global1 1960-1990	0.0000
d.ln southafrica 1960-1990	0.4130
d.ln lesotho 1960-1990	0.6951
ALL	0.0000
Skewness Test	
d.ln global1 1960-1990	0.0000
d.ln southafrica 1960-1990	0.5292
d.ln lesotho 1960-1990	0.7198
ALL	0.0001
Kurtosis Test	
d.ln global1 1960-1990	0.0000
d.ln southafrica 1960-1990	0.2414
d.ln lesotho 1960-1990	0.4391
ALL	0.0000

**H_0: Normal distribution of residuals.*

Table 17: Model 2.1, Lagrange Multiplier Test

Lags	Prob > Chi2*
1	0.8016
2	0.5576
3	0.3568

**H_0: No autocorrelation.*

Table 18: Model 2.2, Selection order criteria

Lags	AIC	HQIC	SBIC
0	-16.0729	-16.0324	-15.9267
1	-16.6585*	-16.4962*	-16.0734*
2	-16.5146	-16.2306	-15.4908

**lag length suggested by information criterion.*

Table 19: Model 2.2, Jarque-Bera Test

Jarque-Bera Test	Prob > Chi2*
d.ln global1 1987-2016	0.2060
d.ln southafrica 1987-2016	0.3955
d.ln lesotho 1987-2016	0.7445
ALL	0.4688
Skewness Test	
d.ln global1 1987-2016	0.3189
d.ln southafrica 1987-2016	0.2172
d.ln lesotho 1987-2016	0.8464
ALL	0.4656
Kurtosis Test	
d.ln global1 1987-2016	0.1410
d.ln southafrica 1987-2016	0.5645
d.ln lesotho 1987-2016	0.4573
ALL	0.3838

**H_0: Normal distribution of residuals.*

Table 20: Model 2.2, Lagrange Multiplier Test

Lags	Prob > Chi2*
1	0.4908
2	0.0960
3	0.8239

**H_0: No autocorrelation.*

Table 21: Model 3.1, Selection order criteria

Lags	AIC	HQIC	SBIC
0	-13.3647	-13.3229*	-13.2195*
1	-13.1447	-12.9775	-12.5640
2	-13.4165*	-13.1239	-12.4003

**lag length suggested by information criterion.*

Table 22: Model 3.1, Jarque-Bera Test

Jarque-Bera Test	Prob > Chi2*
d.ln global1 1970-2000	0.6335
d.ln southafrica 1970-2000	0.9427
d.ln swaziland 1970-2000	0.5183
ALL	0.8854
Skewness Test	
d.ln global1 1970-2000	0.3771
d.ln southafrica 1970-2000	0.9563
d.ln swaziland 1970-2000	0.3695
ALL	0.6620
Kurtosis Test	
d.ln global1 1970-2000	0.7155
d.ln southafrica 1970-2000	0.7346
d.ln swaziland 1970-2000	0.4755
ALL	0.8598

**H_0: Normal distribution of residuals.*

Table 23: Model 3.1, Lagrange Multiplier Test

Lags	Prob > Chi2*
1	0.2904
2	0.6410
3	0.4623

**H_0: No autocorrelation.*

Table 24: Model 3.2, Selection order criteria

Lags	AIC	HQIC	SBIC
0	-16.6082	-16.5677	-16.4620*
1	-16.9958*	-16.8335*	-16.4108
2	-16.8249	-16.5410	-15.8011

**lag length suggested by information criterion.*

Table 25: Model 3.2, Jarque-Bera Test

Jarque-Bera Test	Prob > Chi2*
d.ln global1 1987-2016	0.0002
d.ln southafrica 1987-2016	0.3832
d.ln swaziland 1987-2016	0.6764
ALL	0.0024
Skewness Test	
d.ln global1 1987-2016	0.0050
d.ln southafrica 1987-2016	0.1663
d.ln swaziland 1987-2016	0.7451
ALL	0.0194
Kurtosis Test	
d.ln global1 1987-2016	0.0018
d.ln southafrica 1987-2016	0.9644
d.ln swaziland 1987-2016	0.4109
ALL	0.0153

**H_0: Normal distribution of residuals.*

Table 26: Model 3.2, Lagrange Multiplier Test

Lags	Prob > Chi2*
1	0.3550
2	0.7889
3	0.5815

**H_0: No autocorrelation.*

Table 27: Model 1, Robust specification, Selection order criteria

Lags	AIC	HQIC	SBIC
0	-9.37767*	-9.37767*	-9.28606*
1	-9.37062	-9.37062	-9.09580
2	-9.32578	-9.32578	-8.86773

**lag length suggested by information criterion.*

Table 28: Model 1, Robust specification, Jarque-Bera Test

Jarque-Bera Test	Prob > Chi2*
d.ln southafrica 1987-2016	0.3543
d.ln swaziland 1987-2016	0.4464
ALL	0.4498
Skewness Test	
d.ln southafrica 1987-2016	0.1504
d.ln swaziland 1987-2016	0.2292
ALL	0.1726
Kurtosis Test	
d.ln southafrica 1987-2016	0.9342
d.ln swaziland 1987-2016	0.6823
ALL	0.9165

**H_0: Normal distribution of residuals.*

Table 29: Model 1, Robust specification, Lagrange Multiplier Test

Lags	Prob > Chi2*
1	0.0471
2	0.7159
3	0.6705

**H_0: No autocorrelation.*

Table 30: Model 2.1, Robust specification, Selection order criteria

Lags	AIC	HQIC	SBIC
0	-6.8052	-6.7773	-6.7084*
1	-6.8153	-6.7317	-6.5250
2	-6.9569*	-6.8176*	-6.4731

**lag length suggested by information criterion.*

Table 31: Model 2.1, Robust specification, Jarque-Bera Test

Jarque-Bera Test	Prob > Chi2*
d.ln southafrica 1987-2016	0.3740
d.ln swaziland 1987-2016	0.2396
ALL	0.3058
Skewness Test	
d.ln southafrica 1987-2016	0.4712
d.ln swaziland 1987-2016	0.0917
ALL	0.1861
Kurtosis Test	
d.ln southafrica 1987-2016	0.2288
d.ln swaziland 1987-2016	0.9056
ALL	0.4814

**H_0: Normal distribution of residuals.*

Table 32: Model 2.2, Robust specification, Selection order criteria

Lags	Prob > Chi2*
1	0.2773
2	0.8695
3	0.7702

H_0: No autocorrelation.

Table 33: Model 2.2, Robust specification, Jarque-Bera Test

Jarque-Bera Test	Prob > Chi2*
d.ln southafrica 1987-2016	0.6012
d.ln swaziland 1987-2016	0.6206
ALL	0.7410
Skewness Test	
d.ln southafrica 1987-2016	0.7943
d.ln swaziland 1987-2016	0.9499
ALL	0.9647
Kurtosis Test	
d.ln southafrica 1987-2016	0.3298
d.ln swaziland 1987-2016	0.3297
ALL	0.3868

H_0: Normal distribution of residuals.

Table 34: Model 3.1, Robust specification, Selection order criteria

Lags	Prob > Chi2*
1	0.0864
2	0.8829
3	0.0576

H_0: No autocorrelation.

Table 35: Model 3.1, Robust specification, Jarque-Bera Test

Jarque-Bera Test	**Prob > Chi2***
d.ln southafrica 1987-2016	0.0287
d.ln swaziland 1987-2016	0.3152
ALL	0.0516
Skewness Test	
d.ln southafrica 1987-2016	0.1161
d.ln swaziland 1987-2016	0.1292
ALL	0.0921
Kurtosis Test	
d.ln southafrica 1987-2016	0.0310
d.ln swaziland 1987-2016	0.9296
ALL	0.0981

**H_0: Normal distribution of residuals.*

Table 36: Model 3.1, Robust specification, Lagrange Multiplier Test

Lags	**Prob > Chi2***
1	0.5077
2	0.2885
3	0.0168

**H_0: No autocorrelation.*

Table 37: Model 3.2, Robust specification, Selection order criteria

Lags	**AIC**	**HQIC**	**SBIC**
0	-10.6812	-10.6542	-10.5837
1	-10.8923	-10.8111	-10.5997*
2	-10.9768*	-10.8416*	-10.4892

**lag length suggested by information criterion.*

Table 38: Model 3.2, Robust specification, Jarque-Bera Test

Jarque-Bera Test	**Prob > Chi2***
d.ln southafrica 1987-2016	0.5764
d.ln swaziland 1987-2016	0.9508
ALL	0.8776
Skewness Test	
d.ln southafrica 1987-2016	0.2973
d.ln swaziland 1987-2016	0.9455
ALL	0.5795
Kurtosis Test	
d.ln southafrica 1987-2016	0.9011
d.ln swaziland 1987-2016	0.7564
ALL	0.9457

**H_0: Normal distribution of residuals.*

Table 39: Model 3.2, Robust specification, Lagrange Multiplier Test

Lags	**Prob > Chi2***
1	0.1351
2	0.5293
3	0.2409

**H_0: No autocorrelation.*

Appendix D

Table 40: Trade flows South Africa, 2000-2002

trading partner	**percentage of exports to trading partner of total exports**	**percentage of imports from trading partner of total imports**
Namibia	0.00	0.00
Lesotho	n/a	0.00
Swaziland	n/a	0.00
Botswana	n/a	0.00
Angola	0.31	0.01
Zambia	0.65	0.09
Zimbabwe	0.74	0.31
Malawi	0.25	0.07
Mozambique	n/a	n/a
Madagascar	n/a	n/a
Tanzania	n/a	n/a

Table 41: Trade flows South Africa, 2014-2016

trading partner	**percentage of exports to trading partner of total exports**	**percentage of imports from trading partner of total imports**
Namibia	3.23	0.37
Lesotho	0.95	0.20
Swaziland	1.04	0.81
Botswana	0.60	0.33
Angola	3.33	1.17
Zambia	1.90	0.19
Zimbabwe	1.65	0.22
Malawi	0.30	0.05
Mozambique	2.01	0.69
Madagascar	0.11	0.09
Tanzania	0.38	0.03

Table 42: Trade flows Namibia, 2000-2002

trading partner	percentage of exports to trading partner of total exports	percentage of imports from trading partner of total imports
South Africa	10.83	38.24
Lesotho	10.10	0.00
Swaziland	0.00	0.00
Botswana	0.20	0.09
Angola	3.59	0.10
Zambia	0.02	0.02
Zimbabwe	0.09	0.13
Malawi	0.00	0.00
Mozambique	0.04	0.00
Madagascar	0.00	0.00
Tanzania	0.01	0.00

Table 43: Trade flows Namibia, 2014-2016

trading partner	percentage of exports to trading partner of total exports	percentage of imports from trading partner of total imports
South Africa	7.56	41.65
Lesotho	0.00	0.01
Swaziland	0.10	0.20
Botswana	8.33	2.51
Angola	2.29	0.17
Zambia	2.02	1.51
Zimbabwe	0.24	0.03
Malawi	0.01	0.00
Mozambique	0.37	0.22
Madagascar	0.00	0.00
Tanzania	0.03	0.12

Table 44: Trade flows Swaziland, 2000-2002

trading partner	**percentage of exports to trading partner of total exports**	**percentage of imports from trading partner of total imports**
South Africa	22.87	0.05
Lesotho	0.00	41.20
Namibia	0.01	0.09
Botswana	0.00	0.05
Angola	0.12	0.00
Zambia	0.29	0.19
Zimbabwe	0.70	0.10
Malawi	0.33	0.03
Mozambique	4.11	0.27
Madagascar	0.23	n/a
Tanzania	0.53	0.00