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Structural Change in Mozambique: Economic Performance Before and After the Civil War

Ibraimo Hassane Mussagy (PhD, Associate Professor in Development Economics)
Faculty of Economic and Management. Department of Economics, Catholic University of Mozambique, Beira, Mozambique

Hailegiorgis BigramoAllaro (PhD, Assistant Professor of Agricultural Economics)
Institute of Urban Development Studies, Department of Entrepreneurship and Business Management. Kotebe University College, Addis Ababa, Ethiopia.

ABSTRACT
This paper analyses the economic performance of Mozambique during the three different period, namely: pre civil war period (1980-1992), reconcstruction period (1992-2001) and stabilizaing periood (2001-2013). The apparent existence of structural change during these periods suggests that the civil war affect the economy. Annul macroeconomics time series data, such us the gross domestic product, foreign direct investment, gross capital formation, savings and the exports, were used. The study revealed that Mozambique economy has been subject to a structural change before and after the civil war. The confirmatory analysis was done using the Chow test. The results indicate that for the variables under investigation the endogenously determined break date closely correspond to the important phenomena in the performance of Mozambican economy since 1994.

INTRODUCTION

After the independence in 1975, the Mozambique National Resistance (RENAMO), created in 1976, allegedly by Portuguese settler and business interests with white Rhodesian (Central Intelligence Organization) backing, conducted extensive guerrilla operations in Mozambique during the 1980s. The civil conflict has devastated the country and as a consequence in the early 90s, the World Bank ranked Mozambique as the poorest country in the world, because its per capita income had decreased to about 80 U.S. dollars.

During the 90s, the government altered the national declaration to allow for democracy. The civil conflict ended with the Rome General Peace Agreement in 1992 (Lei n°13/92 de 14 de Outubro). The agreement culminated with the country's first democratic elections of 1994 and the emergence of the Front for the Liberation of Mozambique (FRELIMO) as the dominant political force in the country.

Subsequently the civil conflict government policies were focused on reconstruction and laying the foundations of a market economy. The results were visible and the Gross Domestic Product (GDP) varied considerably during the 1992 to 2013.

Since 1984, the World Bank has been providing development assistance to Mozambique in accordance with the country's needs and priorities, from economic stabilization in the 1980s, to post-war reconstruction in the early 1990s. A comprehensive support strategy to ensure sustainable and inclusive growth has been drawn. We highlighted here the Poverty Reduction Strategy Papers (PRSP) as one of the strategies drawn in collaboration with the government, development partners, and civil society (http://www.worldbank.org/en/country/mozambique).

The Government of Mozambique has presented the first PRSP in 2001-2005 and there were followed by more two PRSP for different periods. The main objectives of these PRSP were to provide continuity to its strategy to combat absolute poverty (GoM, 2010).

Several macroeconomic and social indicators such as GDP per capita, poverty headcount, and life expectancy have significantly improved. This strong performance was aided by the determined implementation of credible macroeconomic policies and structural reforms, a favorable external environment, donor support, and in recent years, the discovery and exploitation of natural resources (FMI, 2014).

The stylised facts of Mozambique's overall economic performance since the 1950s are well explained by Mussagy (2014).It is beyond the scope of the paper to present again in detail the stylized of Mozambique under the period 1975-2014. Therefore, overviews of the economic performance since 1980-2013 are briefly presented in Figure 1. We have separated the period into three different parts.

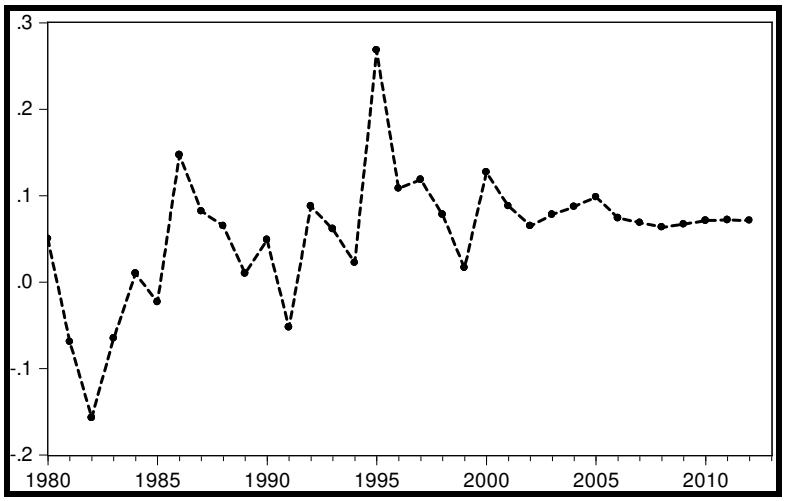

Figure 1: Growth rate of GDP
Source: World Bank, WDI

The following dates are considered important milestones:

1980-1992: The civil war that ends in 1992 is intricately linked with the political macro-economy of Mozambique. The growth rate of the GDP was 0.38% per year

1992-2001: Government policies focused on reconstruction and laying the foundations of a market economy. Since then the focus has been on consolidating the gains and maintaining high rates of economic growth. Durning this period the growth rate of the GDP inscreses to 6.4% per year.

2001-2013: Overall economic performance was strong throughout the two periods, but growth was more volatile in the first decade, with considerable dips in economic performance in 1995 and 2000 owing to weather-related shocks (floods). Economic performance owed much to the market liberalization and privatization policies pursued. In the second period, growth was driven more by investments in megaprojects. Donor support was high throughout the period. This was the period that Mozambique have reached the highest growth rate, 7.88% per year.

The subject of structural change is of considerable importance in the analysis of macroeconomic time series. Structural change occurs in time series data for a number of reasons, including economic crises, changes in institutional arrangements, policy changes and regime shifts among others.

From the current economic growth presented in the Figure 1 it can be seen from the period 1992-2001 that the growth rates become positive. It confirms the popular view that the civil war was disruptive and very destructive to the Mozambican economy.

In this paper, we focus on some of the structural changes that have an impact on Mozambique's economic performance.The value of the GDP indicates that the actual structural break date for the variables was 1992. Besides the visual temptation to conclude about the structural breaks more conclusive results from econometric tests are given.

LIETRATURE REVIEW

The structural change is an important issue when we are analyzing time series data. Structural change, occur when the values of the parameters of the model do not remain the same through the entire time period (Gujarat, p.303). Several reason my lead to a structural change in time series data including economic crises, changes in institutional arrangements, policy changes and regime shifts among others.

> " Sometime the structural change may be due to external forces (e.g., the oil embargoes imposed by the OPEC oil cartel in 1973 and 1979 or the Gulf War of 1990–1991), or due to policy changes (such as the switch from a fixed exchange-rate system to a flexible exchange-rate system around 1973) or action taken by Congress (e.g., the tax changes initiated by President Reagan in his two terms in office or changes in the minimum wage rate) or to a variety of other causes (Gujarat, p.303)".

The discussion on the literature on theoretical aspects of structural breaks have been done for a few years. These literature have focused their discussions on the estimation and practical application of this concept. Few studies carried out in African countries include the one from Kenya, conducted conducted by Ndirangu, García & Ciliaka Gitau (2014), Ethiopia conducted by Allaro & Hundie (2011) and Rwanda conducted by Ruranga, Ocaya & Kaberuka (2011). Therefore, no study for the case of Mozambique was found. This paper aims to fill

the gap for Mozambique by analyzing for the first time the existence of structural breaks on a range of macroeconomics variables during the period before and after the civil war.

METHODOLOGY

The time series data used for the study seeems to have a structural break, due to the end of the civil war in 1992, this event changes the growth of Mozambican economy. In this case the Chow Test was applied to test the existence of endogenously determined structural break time in these dates.

Regression Models

A series of data can often contain a structural break, due to a change in policy or sudden shock to the economy. The F test (chow test) was applied to test the existence of endogenously determined structural break time in these dates. Thus, the study analysis Chow test of Perron (1989) using the structural break analysis model. In this case the first model specifies just a single regression line to fit the data points and two searate models are regreeesded. Then we have applied an Analysis of Variance (ANOVA) which consists of calculations that provide information about levels of variability within a regression model and form a basis for tests of significance.

The selected macroeconomic variables for this study are based on different researches on the determinants of economic growth and on the combination of a relevant variables to analyses the structural breaks. The main determinants of economic growth identified for the case of Mozambique were the Gross Domestic Product (GDP), Foreign Direct Investment (FDI), Gross Capital Formation (GCF), Savings (S) and the Exports (X).

In this case the first model specifies just a single regression line to fit the data points:

Pooled Model: $GDP_t = \beta_0 + \beta_1 FDI_t + \beta_2 GCF_t + \beta_3 S_t + \beta_4 EX_t + \mu_{t1}$

Then two separate regressions, into two time periods, were estimated:

Period 1980-1994: $GDP_t = \alpha_0 + \alpha_1 FDI_t + \alpha_2 GCF_t + \alpha_3 S_t + \alpha_4 EX_t + \mu_{t2}$

Period 1995-2013: $GDP_t = \delta_0 + \delta_1 FDI_t + \delta_2 GCF_t + \delta_3 S_t + \delta_4 EX_t + \mu_{t3}$

Chow Test

Stability tests or tests of structural break models were employed to analyze the economic performance in Mozambique between 1980 and 2013. Chow test is a test depicting structural change; it is a statistical analysis of coefficients in two linear regressions on independent data sets. It is a technique commonly used to verify the presence of structural break.

$$F = \frac{RSSR - (RSS_1 - RSS_2)K}{RSS_1 + RSS_2 / (N_1 + N_2 - 2K)}$$

Where: *RSSR* residual sum of squares of the model on all data; *RSS1* and RSS2 sum of residual squares of the models on the two subset of data (before and after structural break time) respectively; and k number of restrictions (parameters to be estimated).

RESULTS DISCUSSION

Descriptive Evidence

Visual inspection of the times series data is normally the first step to carry out the structural breaks analysis. The variables used to analyze the structural break date in 1992 are presented in a multiple graphs. Figure 2 shows the trend of the selected macro-economic variables for the study. These includes the GDP, FDI, CGF, S and X. The annual data covering the period 1980 to 2013 presents a relatively dynamic snapshot of the economy. A briefly discussion on each variable is followed.

The GDP during the pre-civil war (1980-1992) was lower and have grown at 0.38 percentage point per year. The post-civil war period (1992-2013) shows an increasing trend on the GDP. The annual growth rate reach 7 percentage point per year, one of the highest growth rates in Sub-Saharan Africa. The high growth rates presented by the economy is given to a favorable macroeconomic environment created by the end of the civil war (General Agreement of Peace), policies and programs adopted by the Government such as the PRSP and other credible policies and structural reforms. Since 2002, the main drivers of growth were the public expenditure and FDI. The main sectors benefiting are construction, services to enterprises, transport and communications, the financial sector and extractive industries (AEO, 2014).

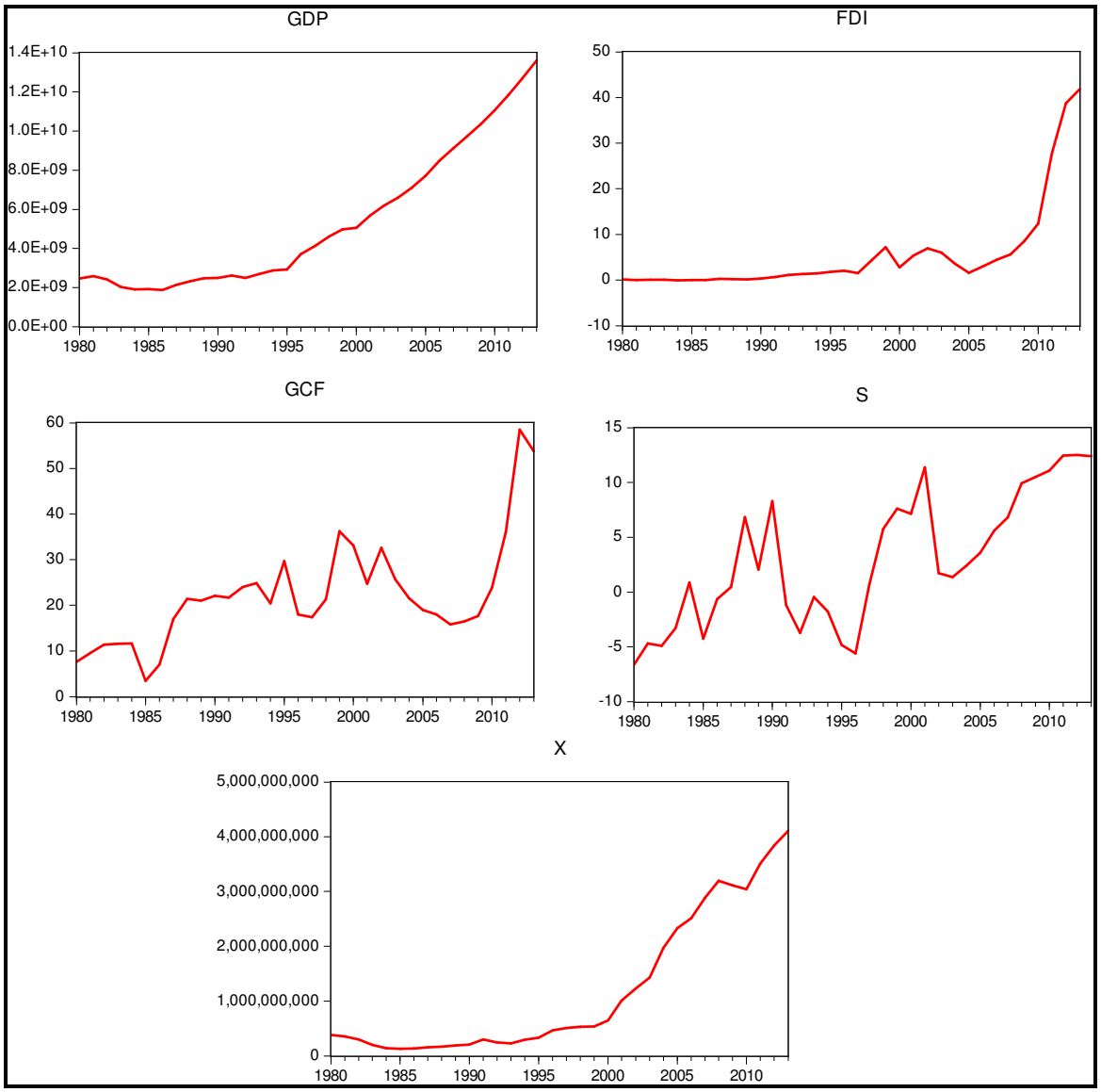

Figure 2: Trend of Annualy from 1980-2014

Source: National Institute of Statistics, INE and World Bank, WDI

The FDI series follow more or less the co-movement fashion of the GDP, of course in a less proportion. It has been relatively lower, it is possible to see that it was almost zero, from the pre-civil war and part of the post-civil war, specifically this period goes from 1984-1998.At the end of 2000, the construction of the first mega-project in Mozambique, the MOZAL aluminum smelter, was completed. Production started in June 2000 and full capacity was reached at the end of year 2001.According to Anderson (2001) the investment activity in 1998 ($220 million) was mainly for earthworks and the construction of buildings, while equipment investment was done in 1999 ($875 million) and 2000 ($245 million). At the end of 2000, the first phase of MOZAL was responsible for a mega investment in Mozambique.

According to Castel-Branco & Goldin (2003) this investment represents almost 1.3 thousand million USD. Then during the 2003 the expansion of the Mozal II huge capacity has been installed and improvements on the FDI have been verified. The MOZAL investment has placed Mozambique in sixth place in the ranking of FDI recipients in Africa. This megaproject is taken as a good example as the first FDI in Mozambique. This was a good example, after the civil war, for the possibilities of investments in Mozambique. Then in the subsequent years several projects on natural resources were invested. Large reserves of natural resources in Mozambique have attracted FDI. According to IMF (2014) the FDI is one of the drivers of the sustained the economic growth in Mozambique. Conversely to FDI, the GCF has been more volatile series. It tends to be relatively sharply upward from 1980-1994.

The S has been negative during a long period of time.The average annual total savings rate in Mozambique was around 13% of GDP in the last half century. According to Francisco, & Siúta (2014), this historical trend has

changed significantly since 1997, the year when the average rate of private consumption became less than 3% of GDP. Meanwhile the rate of public consumption in-creased from 6% to 9% of GDP between 1997 and 2010, respectively.

Prior to 1994 the X series follow a horizontal trend. The ratio exports to GDP increases from 10.3% to 30.2% in 2013. This rise is exclusively attributed to megaprojects. The Mozambique share of world export of aluminum has increased. The analysis under the exemption of aluminum remained stable. In 1999, the first megaproject was launched and since them, they have started to contribute with a higher percentage to GDP. Another fact that improves the exports is the African Growth and Opportunity Act AGOA[1]. According to USAID (2003) since the legislation went into effect, exports under AGOA have increased more than 500 percent, from $8.15 billion in 2001 to $53.8 billion in 2011. Twelve countries in the Southern African Development Community (SADC) have been deemed AGOA-eligible on the basis of political and economic performance criteria. Without list them all, Mozambique was one of the eligible countries. Under this act the exports of Mozambique improved. These countries take full advantage of the legislation to increase trade and business links between the U.S. and the SADC region.

In general, even after given some historical evidence on the trend of data, the analysis is not conclusive and it should proceed. A more accurate result from the structural break is given using the Chow Test.

Results from OLS Estimates

To examine the structural breaks three regressions, equations (1), (2) and (3) were estimated. Table 1 reports the results from the regressions using OLS method.

Table 1: OLS Regression Estimates[2]

Variables	Sample: 1980 2013	Sample: 1980 1994	Sample: 1995 2013
C	1.48E+09*	1.49E+09*	3.14E+09*
S	4.47E+07**	2.01E+07	7.47E+07*
GCF	3.79E+07*	8.46E+06	-4.37E+06
FDI	-9.08E+06	2.36E+08**	4.44E+07***
X	2.44E+00*	2.86E+00	1.92E+00*
R-squared	98	93	99
S.E. of regression	4.69E+08	1.00E+08	3.52E+08
Sum squared resid	6.38E+18	1.00E+17	1.73E+18

Source: Authors

*Significant at 1%, **Significant at 5%, ***Significant at 10%.

With the exclusion of the civil war almost all the variables become positive as expected from the regression and the effects on economic growth. Notice that, under the civil war period the coefficient signs are comparable to the pre-civil war and the post-civil war.

Results from Chow Test

To examine the F-statistic ANOVA test was performed for the three models listed before. Three ANOVA tables were generated, tables (2), (3) and (4).

Table 2: ANOVA, RSS for pooled data

	df	*Sum of squares*	*Mean square*	*F*	*Sig.*
Regression	4	4.17106E+20	1.04277E+20	473.9095242	5.83278E-26
Residual	29	6.38101E+18	2.20035E+17		
Total	33	4.23487E+20			

Source: Authors

[1] AGOA, enacted in 2000 and implemented in 2001, offers the most liberal access to the U.S. market available to any country or region with which the U.S. does not have a Free Trade Agreement. AGOA extends the Generalized System of Preferences (GSP) status for qualifying African countries to September 2008 and expends the existing list of 4,650 GSP products by1,837

[2]The estimations and the various tests were carried out using EVIWS 8

Table 3: ANOVA, RSS for before structural break (1980-1994)

	df	*Sum of squares*	*Mean square*	*F*	*Sig.*
Regression	4	1.25E+18	3.13E+17	31.26261	1.25E-05
Residual	10	1E+17	1E+16		
Total	14	1.35E+18			

Table 4: ANOVA, RSS after structural break (1995-2013)

	df	*Sum of squares*	*Mean square*	*F*	*Sig.*
Regression	4	1.84E+20	4.6E+19	371.7172	4.88E-14
Residual	14	1.73E+18	1.24E+17		
Total	18	1.86E+20			

Source: Authors

Chow Test

Is there a significant difference in the models for the two groups? Based on these out puts the F-test was calculated using the following formula:

$$F = \frac{RSSR - (RSS_1 - RSS_2)K}{RSS_1 + RSS_2 /(N_1 + N_2 - 2K)}$$

The result from F test is then given by:

$$F = \frac{1.13\text{E}+19 - (1.83\text{E}+18 - 2.80\text{E}+01) * 3}{1.83\text{E}+18 + 2.80\text{E}+01/(15+19-6)} = 172$$

The critical value at the .05 level is 2.60. Since our F value is greater than the critical value, we can reject the null hypothesis that the b and gamma values are the same. We are therefore justified in using separate models for the two groups. There is a structural break in Mozambican macroeconomic variables.

CONCLUSION

This paper examines the structural break dates macroeconomic variable such Gross Domestic Product, Foreign Direct Investment, Gross Capital Formation, Savings and the Exports. in Mozambique using annual time series data ranged from 1980-2014. The Mozambican economy has been subjected to a civil war during the period under analysis. The data was analyzed using the ANOVA table and the F-statistics (chow test) approach was used to determine endogenously the more likely time of structural breaks for the selected variables.

Based on the above models, the presences of one unknown structural break time in the data are considered. After accounting for the single most significant structural break, the results from the Chow test models clearly indicate that for all series under examination, the null hypothesis of no structural break time can be rejected.The results from the research indicate that for the variables under investigation the endogenously determined break date closely correspond to the important phenomena in the performance of Mozambican economy since 1994.

The critical value for F (4, 34) is 2.92 at 5% significance level. This implies that the test statistic (182) is greater than the 95% critical value (2.51) of F-test; it is possible to reject the null of no structural break times in macroeconomic variables under investigation. It was concluded that there is structural break time in Mozambican macroeconomics variables.

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