

Exchange rate regime and economic growth in Tunisia

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Research Article

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Abstract

The study focuses on the relationship between the exchange rate regime and economic growth in Tunisia during the period 1982–2014. Using a time-series regression model approach, we chose the regression model, then, we performed descriptive statistics and correlation between the variables. We concluded that the variables used are correlated with each other, but there is a problem of multicollinearity. We performed stationary testing. We found that the ADF test statistics and Phillips and Perron and the Durbin-Watson test. However, there is no stationarity for Trade Balance Value. And not significant overall when we estimated the regression model, we performed the Durbin-Watson test. We noted that there is complete verification, as there are no errors in the time series data.

We conclude that there is a relationship between the exchange rate regime and economic growth in Tunisia, despite the fact that there is a negative impact on the trade balance.

1. Introduction

The main objective of the Bretton Woods agreements was to establish a global monetary system with the aim of promoting economic growth in developing countries. At the beginning of the 1970s, this system was abandoned. The question of choosing an exchange rate regime has been an important issue in international economics. One of the causes of this collapse was the contradiction between the objective of internal equilibrium, which aims to create jobs, and external equilibrium in the balance of payments. In fact, full employment has increasingly become the main objective of domestic economic policies. The choice of a fixed exchange rate conflicts with this objective, particularly when economies are experiencing real or foreign shocks. In the late 1970s, the theoretical debate focused on the link between the choice of exchange rate regimes and economic growth. It now centers on the development of new evidence regarding the choice of exchange rate regimes that promote financial stability and the credibility of economic policies. In this context, starting in 1973, industrialized countries such as the United States, Japan, and Germany adopted floating exchange rate regimes. In Europe, the euro was created thanks to the establishment of a monetary union. In developing countries, exchange rate policy trends are heterogeneous. They depend on each country's situation and level of growth. Thus, some countries have adopted a fixed exchange rate regime, while others have opted for an intermediate exchange rate regime or a floating exchange rate regime. The exchange rate channel plays a key role as a monetary policy transmission mechanism. Several theoretical and empirical studies have shown that there is a positive relationship between the choice of exchange rate regime and countries' economic performance. However, others argue that this relationship is not sufficiently clear.

In this paper, we propose to participate in a debate and shed light on the relationship between the choice of exchange rate regime and economic growth. We base our analysis on data relating to the Tunisian economy during the period 1982–2014. So, is there a relationship between the exchange rate regime and economic growth in Tunisia? And what is the sign of this relationship?

Following the introduction, the paper is organized as follows. It starts by detailing the materials and methods in Section 2. Section 3 describes results and discussion. Section 4 the conclusion.

2. Materials & Methods

2.1. Theoretical considerations and results of empirical studies

Paulo Gala and Eliane Araujo (2012) mentioned that some theoretical studies have focused on the choice of the exchange rate. They define the exchange rate by the quality of real wages and the setting of relative prices. A currency appreciates when there is a decrease in tradable prices and real wages, consumption is higher, and investment is reduced. Conversely, a currency depreciates when tradable prices are high and real wages are low. They indicate that it is possible to investigate weaknesses in investment due to technological overvaluation. These weaknesses negatively affect, first, the overall productivity dynamics of the economy and, second, under-appreciation contributes to more employment and investment. Capacity utilization is increased through higher exports. The conclusion is that once a country gains a growth advantage, it will tend to maintain it through the mechanism of increasing returns and competitiveness gains. According to Thirlwall, A.P. (1979), economic equilibrium is linked to a country's ability to maintain its external balance. Under the limiting assumption, he indicated that the growth rate is given by the ratio between export growth and the income elasticity of imports. A competitive exchange rate can lead to a decline in the income elasticity of aggregate demand for imports, with positive effects. Petreski Marjan (2009) mentioned that there are numerous studies that affirm there is a link between exchange rate regimes and economic growth. However, the nature of this influence is unclear. He pointed out that the regime could influence growth, trade, investment, and productivity. He indicated that the best regime is a flexible exchange rate regime. Aghion et al. (2005) noted that increased exchange rate volatility leads to a larger share of firms in the economy experiencing credit constraints, given underdeveloped financial markets. Bailliu et al. (2003) mentioned that the influence of the regime on growth has a direct impact through the effect of the regime on shock adjustments, or an indirect impact through investment, international trade, and the development of the financial sector.

In Tunisia, during the 1970s, especially after the collapse of the Bretton Woods system, most countries shifted from fixed to floating exchange rates. In this situation, Tunisia underwent a number of economic changes. The monetary authority pegged its currency to the French franc since France was its primary trading partner. From 1973 to 1975, the imbalance of the French franc (FF) forced the Tunisian government to abandon its position on this currency. Hence, the choice of the Deutsche Mark (DM) as the reference currency, in order to reduce exchange rate variability relative to other currencies. In 1978, Tunisia adopted the principle of pegging its currency to a basket of currencies in order to eliminate the fluctuations of a single currency. Thus, the US dollar was included in the basket of currencies to which the dinar was pegged, and the monetary authorities also took into account the availability of foreign

exchange. From 1980 to 1984, Tunisia maintained its nominal exchange rate (NER) within a stable band against the French franc (FF). The fall in oil prices and export policy led the monetary authorities to expand the basket to include other currencies, such as the Italian lira, the Belgian franc, and the Spanish peseta. As a result, the real exchange rate (RER) increased by 73% between 1975 and 1984. From 2004 onwards, a new Tunisian tax law also provided for the liberalization of the capital account and a flexible exchange rate policy (Chebbi, H. and Olarreaga, M., 2011). Moreover, the Tunisian dinar was in equilibrium in 2002. They suggested that Tunisia could avoid the pitfalls of exchange rate policy, which are the cause of persistently high inflation rates. This exchange rate misalignment leads to a balance of payments crisis (Fanizza et al., 2002).

Charfi, M.F. and Guermazi, S.F., 2012, demonstrated that since 2000, as part of a strategy for regional growth and global integration, monetary authorities have implemented a more flexible exchange rate policy and have adopted a currency in the broad sense as a nominal anchor. The nominal effective exchange rate (NEER) has depreciated by around 20% since 2000–2006 and 35% since 2000–2010, with stopping points detectable. The absence of shocks is combined with a cautious mix of macroeconomic policies, with rigid prices and wages prevailing in the country. The aim is to avoid persistent high inflation (5.1% on average over 1990–1999) and exchange rate misalignment. Charfi, M.F. (2009) mentioned that the euro is strengthening against the dollar since the euro accounts for approximately 70% of the dinar's currency basket. Foreign debt is 45% in US dollars, 30% in Euros and 10% in yen. This means that this strategy is sensitive if the dollar appreciates, as debt servicing has been readjusted, and she showed that since 2000, the central bank has implemented a flexible exchange rate policy whereby the dinar is gently pegged to a basket of currencies composed of 65% Euros and 35% dollars. In fact, the nominal effective exchange rate (NEER) depreciated by around 20% between 2000 and 2006 and by around 35% between 2000 and 2010. A comparison between the real and nominal exchange rate indices highlights Tunisia's exchange rate management over the entire period, showing that nominal variability is greater than real variability. Thus, she stated that exchange rate policy during the last financial crisis (2007–2009) was characterized by a constant real exchange rate ($\varepsilon = 0.76$). Indeed, Tunisia is a small economy that is highly dependent on foreign countries and is keen to preserve its competitiveness. Thus, the monetary authorities adjust the nominal exchange rate in order to maintain a constant real exchange rate (RER) (Charfi, M.F., 2010). Chebbi, A et al. (2014) indicated that the instability of the dinar's exchange rate against the euro and the dollar observed in 2013 was the result of certain factors. The first factor was the recession in Europe, and the second was the nature of the flexible exchange rate regime adopted during Tunisia's current transition. One of the consequences of the instability of the national currency was the instability of public spending. This public spending led to a revision of budgetary choices at the end of the fiscal year. It is reported that the initial deficit forecast of 5.9% in the budget has been revised to 6.8%. Thanks to additional regulatory measures and the rationalization of public spending implemented by the authorities to avoid the deficit. The macroeconomic balance is fragile, casting doubt on projected tax revenues and external financing.

However, the empirical literary review, Rizzo J.M., 1999, analyses the relationship between the nature of the exchange rate regime adopted in Latin America, Southeast Asia and the Mediterranean and

economic growth during the period 1980–1995, based on a sample of 29 countries. The econometric estimates were performed using the ordinary least squares (OLS) method. This analysis only results in the choice of an exchange rate regime with a neutral impact and limited influence on economic growth. Chaker.A and Sassi.H, 2005, estimated panel data for 53 countries over the period 1973–1998, applying the generalized moment's estimation method. They mentioned the importance of nominal anchoring, which is accepted by the central bank. In order to assess the impact of exchange rate regimes on macroeconomic outcomes, they showed that fixed, intermediate and floating exchange rate regimes have a positive influence on growth. Allegret et al. (2008) analyses the choice of exchange rate regime in emerging and developing countries. They demonstrated the existence of an optimal exchange rate regime. They took into account the use of exchange rates as an adjustment tool, the role of price sensitivity to exchange rate fluctuations and the importance of financial channels. They empirically tested the model developed by Aizenman and Hausmann (2000) on a sample of 43 emerging and developing countries. The estimates obtained showed that there is a significant sensitivity of prices to exchange rate fluctuations. Countries adopt this for greater stability than the predominance of nominal shocks in developing countries. They point out that pure flexibility is not a good solution. Similarly, the fact that real shocks remain significant. They showed that pure fixity can be costly. It is argued that intermediate regimes seem to be a well-suited solution for emerging and developing countries, provided that these countries suffer from a balance sheet effect and that the banking system is important for investment financing. Marjan.P (2009) estimated using the Dynamic Panel Data method on 169 countries over the period 1976–2006, concluding that the exchange rate regime does not have explanatory power over economic growth. To that end, it showed, using the co-integration method, the error correction model and an analysis of shocks using the variance decomposition method, that the dynamics of exchange rates in Morocco are determined by variables such as terms of trade, foreign exchange reserves, foreign claims and shock analysis. They indicated that exchange rate dynamics in Morocco are determined by variables such as terms of trade, foreign exchange reserves, foreign claims and shock analysis, with demand and supply dynamics appearing to be decisive Bouhadi. A et al. 2010.

2.2. Model selection: estimates and tests

This study empirically examines the impact of macroeconomic variables on the relationship between exchange rate regimes and economic growth. The data used in our empirical analysis comes from the World Bank (WB), the United Nations Conference on Trade and Development (UNCTAD) and the International Monetary Fund (IMF) for the period 1982–2014. The data are annual, and the analysis focuses on the Tunisian economy.

Our model is inspired by the work of Jean Mark Rizzo (1998), who treated it as follows:

$$\text{Eq. (A.1), } \text{Log} (GDP_t) = \alpha + \beta \text{Log} (REER_t) + \gamma \Delta TBV_t + \lambda \text{Log} (FDI_t) + \epsilon_t$$

With

Log: Neperian logarithm

GDP: Constant gross domestic product (current US dollars)

REER: Real effective exchange rate index (2010 = 100)

TBV: Trade Balance Value, annual in millions of dollars

FDI: Inflow of Foreign Direct Investment in Millions of \$

t indicates time; $t = 1982, \dots, 2014$.

α , β , γ , and λ are parameters to be estimated.

ε_t refers to the term error.

Eq. (A.1), presents the empirical model that will be estimated in this study. Using this model, it is possible to examine the relationship between the exchange rate regime and economic growth in Tunisia.

Figure 1. In our study, we use the endogenous variable $\text{Log}(\text{GDP}_t)$: GDP per capita, which is the ratio between gross domestic product and the total population at mid-year. This ratio measures a country's standard of living.

GDP is an economic indicator that measures the wealth produced within a country or geographical area over a given period. GDP is calculated by adding together the value added within a country by all sectors of activity, plus value added tax and customs duties. In our study, we used this indicator to measure the growth rate of this economy. The data are represented in current US dollars. The graphical representation of this variable is shown below: This graph shows a very significant upward trend from the early 1990s to the end of 2010, due to a major transformation of the Tunisian economy.

Figure 2. With regard to explanatory variables, we will first take the real exchange rate index with the application of the natural logarithm function $\text{Log}(\text{REER}_t)$. The REER is the current nominal exchange rate (measured using nominal parities without taking into account differences in purchasing power between the two currencies), divided by a price deflator or cost index.

In our study, we used this index to measure the real effective exchange rate of this economy. The data is based on (2000 = 100). The graphical representation of this variable is shown below.

According to this graph, there is a downward trend, especially in the mid-1980s. Then there is a steady trend at the end of the 1990s, following the impact of the liberalization of the Tunisian dinar. In the 2000s, there is a downward trend due to inflation and the increase in external debt servicing in Euros.

Figure 3. The trade balance is the account that tracks the value of exported goods and services and the value of imported goods and services. In other words, it is the difference between exports of goods and services and imports. In our study, we used this indicator to measure the trade balance of this economy. The data is in current US dollars. The graphical representation of this variable is shown below. According

to this graph, there is an upward trend. This is because the value of imports exceeds that of exports. As a result, the country has a trade deficit.

Finally, the inflow of Foreign Direct Investment with the application of the natural logarithm function (Log (FDI)). Foreign direct investment is the net inflow of investment to acquire a lasting interest (10% or more of the voting shares) in a company operating in an economy other than that of the investor. Foreign direct investment is the sum of equity capital, reinvested earnings, other long-term capital and short-term capital recorded in the balance of payments. In our study, we used this indicator to measure the inflow of foreign direct investment in this economy. The data is in current US dollars.

3. Results and discussion

3.1. Descriptive statistics and correlation between variables

Table 1. In light of the results obtained in Table 1, we note that neither the dependent variable nor the independent variables follow a reduced centered distribution. In fact, for a variable to follow a reduced centered distribution skewness must be zero and kurtosis must be equal to 3. We also note that our estimates are of good quality, as the variance of the different variables is low. However, the variance of the trade balance is very high (273,084.7). We also note that the average economic growth log indicator (Log (GDP)), which measures the level of growth for our sample, is slightly high (7.718825) with a maximum (8.40437) and a minimum (7.05477). This table also shows that the average log of the real effective exchange rate ratio index (Log (REER)) is high (4.83942) with a maximum (5.386103) and a minimum (4.560225). It appears that the average trade balance variance indicator is low (-205.4634) with a maximum (667.382) and a minimum (-1384.443). It also appears that the average log of indirect foreign investment (Log (FDI)) is low (6.184746) with a maximum (8.104095) and a minimum (4.332968). To determine the relationship between the different variables, we will present the different correlation coefficients. A high correlation coefficient (close to 1 in absolute value) indicates a strong correlation between the variables used. However, a low correlation coefficient (close to 0) indicates a weak correlation between the variables used.

Table 1
Descriptive statistics of variables

Stats	Ln (GDP)	Ln (REER)	Δ TBV	Ln (FDI)
mean	7.718825	4.83942	-205.4634	6.184746
max	8.40437	5.386103	667.382	8.104095
min	7.05477	4.560225	-1384.443	4.332968
variance	.2229536	.058686	273084.7	1.132141
kurtosis	1.651671	3.563911	2.830116	2.100079
skewness	.0534048	1.183003	-.570328	-.202565

Table 2. With regard to this correlation table or matrix, the correlation coefficients are, on average, high. We can conclude that the variables used are correlated with each other. Furthermore, based on this matrix, we can see that there is a problem of multicollinearity between the explanatory variables.

Table 2
Correlation coefficients of explanatory variables

Variables	Log (GDP)	Log (REER)	Δ TBV	Log(FDI)
Log (GDP)	1.0000			
Log (REER)	-0.8459	1.0000		
Δ TBV	-0.3823	0.3357	1.0000	
Log(FDI)	0.8886	-0.6687	-0.3745	1.0000

3.2. Model estimation

Our model is therefore:

$$\text{Eq. (A.1), } \text{Log}(\text{GDP}_t) = 10.4 - 0.88 \text{Log}(\text{REER}_t) - 0.000011 \Delta \text{TBV}_t + 0.26 \text{Log}(\text{FDI}_t)$$

$$(11.7)^{***} \quad (-5.83)^{***} \quad (-0.2) \quad (7.34)^{***}$$

***Significant at the 1% level; ** Significant at the 5% level; * Significant at the 10% level

The model is statistically significant overall with (Prob > F) = 0.0000 and F(3, 29) = 91.39.

The variable ΔTBV_t is not statistically significant, and the model coefficient α is equal to (10.4), which is statistically significant at the 1% level.

The variable $\text{Log}(\text{FDI}_t)$ is statistically significant at the 1% threshold with a positive coefficient equal to (0.26), meaning that a 1% increase in $\text{Log}(\text{FDI}_t)$ translates into a 26% increase in $\text{Log}(\text{GDP}_t)$. We can say

that foreign direct investment has a slight positive effect on economic growth.

The variable $\text{Log}(\text{REER}_t)$ is statistically significant at the 1% threshold with a negative coefficient equal to (-0.88), meaning that a 1% increase in $\text{Log}(\text{REER}_t)$ translates into an 88% decrease in $\text{Log}(\text{GDP}_t)$. It can be said that the real effective exchange rate has a very significant negative effect on economic growth.

$R^2 = 0.9043$, which is close to one. Therefore, the model allows $\text{Log}(\text{GDP}_t)$ to be explained by the choice of a whole class of explanatory variables.

Table 5. We note that the basic conditions for using the Durbin-Watson test are fully met, as there is no autocorrelation of errors in the time series data. In our time series model with a lag equal to one, with a number of observations of 33, the Durbin-Watson statistic = 0.9951779.

Table 5 Durbin-Watson Test			
Durbin-Watson d-statistic (4, 33) = 0.9951779			
Durbin-Watson Test AR(1)			
Retard (P)	chi2	Df	Prob > chi2
1	9.048	1	0.0026
H ₀ : absence of autocorrelation of errors in the time series data			

4. Conclusion

The objective of this article was to analyze theoretically and study empirically the relationship between the exchange rate regime and economic growth in Tunisia.

First, we focus on the issue of choosing an exchange rate regime. This can be defined as the set of rules that determine monetary authorities' actions on the foreign exchange market. There are three types of exchange rate regimes: the fixed exchange rate regime, which leads to low inflation and growth and imposes fiscal discipline; the floating exchange rate regime, which allows for rapid relative price adjustment following asymmetric shocks; and finally, the intermediate exchange rate regime.

Next, we provide a brief history of the monetary system and determine the effect of the exchange rate regime on inflation and growth through analysis.

Second, we focus on analyzing exchange rate policy and economic policy in Tunisia. We conclude that the most favorable exchange rate regime is a managed float, with appropriate intervention by the central bank.

Thus, Tunisia has been considered a model of success for its economic performance. However, the inherent weaknesses of the economic development model have been revealed, especially since the events of the revolution of 14 January 2011.

In the end, we focus on the empirical study for Tunisia. We used econometric time series techniques relating to the Tunisian economy from 1982 to 2014.

First, we chose the regression model. Then, we performed descriptive statistics and correlation between the variables. We concluded that the variables used are correlated with each other, but there is a problem of multicollinearity.

Secondly, in Table 3, we performed stationary testing. We found that the ADF test statistics are greater than MacKinnon's values in absolute terms, at significance levels of 1%, 5%, and 10% for the variables $\text{Log}(\text{GDP}_t)$ and $\text{Log}(\text{FDI}_t)$, 1% and 5% for the variable $\text{Log}(\text{REER}_t)$, and 1% for the variable ΔTBV_t .

Table 3
Augmented Dicky-Fuller (ADF) stationarity test

Variables	Stationarity	T-statistic	Critical Value	Probability	Results
Log (GDP)	In level	-0.307	-3.709* -2.983** -2.623***	0.9245	Stationary at the threshold of 1%, 5%, 10%
	In difference	-3.114	-4.325* -3.576** -3.226***	0.1029	Stationary at the threshold of 1%, 5%, 10%
Log (REER)	In level	-2.674	-3.709* -2.983** -2.623***	0.0786	Stationary at the threshold of 1%,5%
	In difference	-3.522	-4.325* -3.576** -3.226***	0.0371	Stationary at the threshold of 1%,5%
Log (FDI)	In level	-0.829	-3.709* -2.983** -2.623***	0.8106	Stationary at the threshold of 1%,5%,10%
	In difference	-2.792	-4.325* -3.576** -3.226***	0.1998	Stationary at the threshold of 1%,5%,10%
Δ TBV	In level	-3.151	-3.709* -2.983** -2.623***	0.0230	Stationary at the threshold of 1%
	In difference	-4.221	-4.325* -3.576** -3.226***	0.0042	Stationary at the threshold of 1%
*Critical value at the 1% threshold;** Critical value at the 5% threshold;*** Critical value at the 10% threshold					

Furthermore, in Table 4, we found that the Phillips and Perron (1988) test statistics are superior to MacKinnon's values in absolute terms at significance levels of 1%, 5%, and 10% for the variables $\text{Log}(\text{GDP}_t)$ and $\text{Log}(\text{FDI}_t)$ and 1% and 5% for $\text{Log}(\text{REER}_t)$. However, there is no stationarity for the variable ΔTBV .

Table 4
Phillips and Perron (1988) stationarity test

Variables	Stationarity	T-statistic	Critical Value	Probability	Results
Log (GDP)	In level	-0.132	-3.702* -2.980** -2.622***	0.9462	Stationary at the threshold of 1%,5%,10%
	In difference	-2.882	-4.316* -3.572** -3.223***	0.1683	Stationary at the threshold of 1%,5%,10%
Log (REER)	In level	-2.163	-3.702* -2.980** -2.622***	0.2199	Stationary at the threshold of 1%,5%,10%
	In difference	-1.949	-4.316* -3.572** -3.223***	0.6290	Stationary at the threshold of 1%,5%,10%
Log (FDI)	In level	-0.961	-3.702* -2.980** -2.622***	0.7673	Stationary at the threshold of 1%,5%,10%
	In difference	-3.563	-4.316* -3.572** -3.223***	0.0332	Stationary at the 1%, 5% threshold
Δ TBV	In level	-7.741	-3.702* -2.980** -2.622***	0.0000	Non-stationarity
	In difference	-9.649	-4.316* -3.572** -3.223***	0.0000	Non-stationary, this is a DS=trend rocess without drift
*Critical value at the 1% threshold;** Critical value at the 5% threshold;*** Critical value at the 10% threshold					

Thirdly, we estimated the regression model and found that it is significant overall. However, the variable ΔTBV is not significant. On the other hand, the other variables, $\text{Log}(GDP_t)$, $\text{Log}(REER_t)$, and $\text{Log}(FDI_t)$, are significant.

Finally, we performed the Durbin-Watson test. We noted that there is complete verification, as there are no errors in the time series data.

From this, we can conclude that there is a link between the exchange rate regime and economic growth, despite the negative effect on the trade balance.

Indeed, if the monetary authorities, under the supervision of the Tunisian Central Bank, do not respect their agreement to guarantee parity, they will be punished by weaker economic growth.

Declarations

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Website

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<https://data.imf.org/en/Datasets>

<https://perspective.usherbrooke.ca/bilan/BMEncyclopedie/BMEncycloListePays.jsp>

Figures



Figure 1

Constant Gross Domestic Product

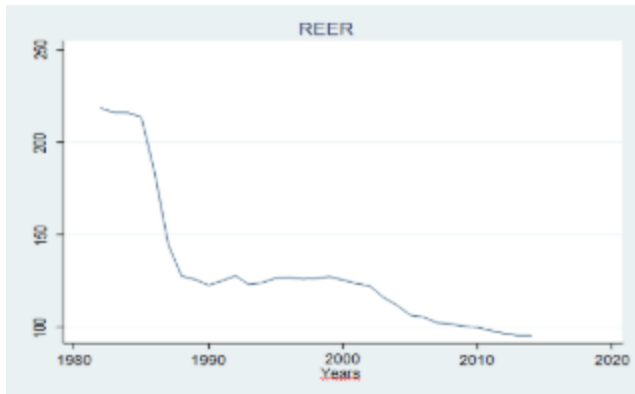


Figure 2

the real effective exchange rate index

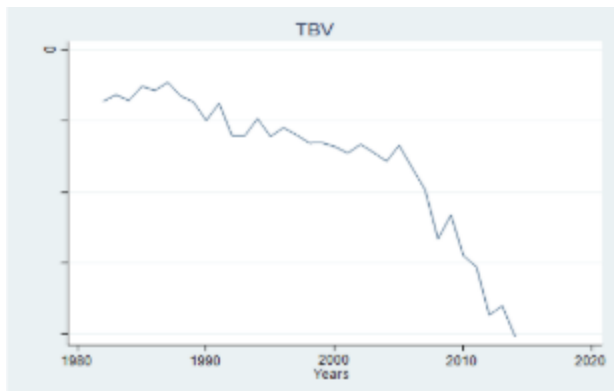


Figure 3

Trade balance value