



Macroeconomic Fluctuations in Tunisia: A Structural Vector Autoregression Approach

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Abstract

The purpose of this paper is to analyze the sources of macroeconomic fluctuations in Tunisia.

Utilizing a structural vector autoregression approach over the period 1970-2009, the results demonstrate that the Tunisian economy is particularly vulnerable to domestic shocks, especially real supply shocks, and external shocks especially terms of trade shocks. In view of our results, we suggest some policy recommendations to reduce the economic impact of these shocks on the Tunisian economy.

Keywords: Macroeconomic Fluctuations, Structural Vector Autoregression, External shocks, Internal shocks.

JEL classification: E32, E60, F44.

I. Introduction

Tunisia has experienced, since the first oil shock of 1973, instability of the main macroeconomic variables, especially economic growth due to the occurrence of internal and external shocks that have affected the Tunisian economy.

A large theoretical and empirical literature dealing with the analysis of macroeconomic fluctuations in developing countries, demonstrates the usefulness of structural models of vector autoregressive (SVAR) in their analyzes. According to a study by Mendoza (1995), changes in economic growth and the real exchange rate in developing countries mainly come from shocks to terms of trade of 50%. Hausman and Covian (1995) in their study on a group of Latin American countries found that external shocks play an important role in explaining fluctuations in economic growth and the real exchange rate. Hoffmaister and Roldos (1997), show that fluctuations in developing countries are mainly due to internal shocks. According to these authors, the fluctuations of GDP in Asian countries are mainly due to the impact of terms of trade and world interest rate (the contribution is 7% and 6% respectively). These authors also show that changes in GDP in Sub-Saharan Africa countries are also due to changes in the World

interest rate and terms of trade. However, in these countries, it is the variation of the terms of trade that contributes most to the fluctuations at 15%. Similarly, Hoffmaister and Roldos (1997) compared the countries of Asia and Latin America. They showed that in these countries, GDP fluctuations are mainly due to supply shocks and productivity shocks labor supply. They also showed that external shocks have a strong contribution in the variability of economic activity. The study of Hoffmaister and al. (1998) on the countries of the African Financial Community, revealed that external shocks mainly terms of trade shocks, influence the internal variables in these countries. Agenor, Dermott and Prasad (1999), sought the sources of macroeconomic fluctuations for twelve developing countries. Their results show that there is a positive relationship between fluctuations in GDP of these countries and those in developed countries through the interest rate. Their results confirm that the fluctuations of GDP in developing countries arise mainly from external shocks. According to a study in the MENA region, Hirata, Kim and Kose (2007), found that the main fluctuations of GDP and in particular those resulting primarily shocks to terms of trade due to over 60%. According to these authors, another external shock explains a significant economic disruption in these countries: the movements of World interest rate significantly influence the trade balance. In addition, these authors also showed that internal shocks have a role in explaining economic fluctuations: productivity shocks and government spending shocks explain respectively 40% and 10% of GDP fluctuations in these countries.

According to this literature, it is necessary to identify the sources of macroeconomic fluctuations if we aim to find the way to smooth it. In light of these considerations, this paper seeks to document the sources of macroeconomic fluctuations in Tunisia by measuring the relative importance of domestic versus external shocks during the period 1970- 2009 by using a structural vector autoregression approach.

The remainder of the paper is organized as follows. Section 2 investigates empirically the contribution of domestic and external shocks to fluctuations. Section 3 presents implications for the conduct of economic policy in Tunisia. Section 4 concludes.

II. Modeling Macroeconomic Fluctuations in Tunisia

The macroeconomic fluctuations in Tunisia are modelled following the structural vector autoregression (SVAR) approach proposed by Blanchard and Quah (1989) and Shapiro and Watson (1988). Among the advantages of this method is that it relies primarily on long-run restrictions stemming from economic theory. The usefulness of this structural VAR model is that it allows the measurement of the importance of external versus internal shocks. It also recovers the adjustments of the economy following standard economic shocks.

II.1. The structural VAR Model

II.1.1. Selection of variables

In the present paper, the study focuses on a small open economy. In fact, Tunisia is experiencing a high degree of openness but its weight in the global economy is much weaker. We use two blocks of variables: the first block includes domestic variables, the second block contains external variables. The assumption of a small open economy implies that the first block of variables is exogenous, implying that domestic shocks do not affect the external sector variables.

However, the domestic variables are assumed to be affected by external shocks. We have selected the following domestic endogenous variables: real domestic GDP (*RGDP*), effective real exchange rate (*ERER*) quoted to the uncertain, and the consumer price index (*CPI*).

To assess the contribution of external shocks to fluctuations in economic activity, we believe that it can be properly measured by real GDP. This variable can also generate, through the equation that corresponds to the structural VAR model innovation corresponding to the supply shock. The evolution of productivity or real shocks can be reflected by the supply shock. Equations for the real effective exchange rate and the consumer prices index we provide information on the impact of economic policy based shocks. In Tunisia, the price levels are closely linked to macroeconomic policy decisions about macroeconomic especially monetary and fiscal policies. Concerning real exchange rate, it may be obviously affected by nominal adjustments through decisions of public authorities. This variable can also teach us about fiscal shocks given the works have empirically confirmed that an increase in government spending would leads to the appreciation of real exchange rates that public spending is largely composed of non-tradables goods (Hoffmaister and Roldos 1997, Alexander and al.1998)).

It would also be interesting to analyze the effects of external shocks on the two mentioned endogenous macroeconomic variables.

For the external shocks, we have selected the terms of trade (TT) and foreign demand (FGDP). The terms of trade can summarize the evolution of prices of exported and imported goods that are determined on the world market. For foreign demand, the fact that Tunisian exports are concentrated on the market of the European Union enhances the sensitivity of Tunisian exports to changes in growth rates in these countries. Foreign real GDP is constructed on the basis of real GDPs of major trading partners of Tunisia weighted by the relative contribution of these countries to trade in Tunisia. In our study, all variables are in natural logarithms.

II.1.2. Characteristics of the Time – Series

Before turning to the estimates, it is a prerequisite to conduct tests of stationary. We used the Dickey-Fuller (ADF), Phillips-Perron (PP) and Kwiatkowski, Phillips, Schmidt and Shin (KPSS), which have the advantage of operating a different treatment. They reverse the proposal accepted as a null hypothesis (H_0 : unit root) when running ADF and PP tests, replacing it by the null hypothesis (H_0 : stationary). KPSS tests inconclusive in the case of non-rejection of H_0 by the other two tests. We report the results of these different tests for different variables in Table 1 of the Appendix. All tests of stationary agree on the non-stationary of the terms of trade and the consumer prices index and the stationary of real domestic GDP, the real effective exchange rate and foreign demand. In addition, all tests agree on the stationary in first differences of the terms of trade and the consumer index price.

II.1.3. Identification of the structural VAR

The structural VAR model uses the long-term properties of the model to detect long-term economic shocks underlying and estimate their relative importance and their cyclical effects from a model with the necessary condition for the independence of shocks (ortogonality conditions) to identify the economic shocks from a reduced-form model.

The basic structural VAR model in our study contains five variables which are: the terms of trade in logarithm and in first difference (*DLTT*), domestic output in logarithm (*LRGDP*), foreign

output in logarithm (*LF**GDP*), the effective real exchange rate in logarithm (*LERER*) and consumer prices index in logarithm and in first difference (*DL**CPI*).

The matrix form of the equation of the VAR model is selected as follows:

$$AY_t = \sum_{i=1}^p B_i Y_{t-i} + \varepsilon_t \quad (1)$$

With *Y* is the vector containing the five endogenous variables.

A is a square matrix of coefficients to be estimated.

ε is a vector of shocks or innovations.

P is the number of delays.

Reduced form model is:

$$Y_t = A^{-1} \sum_{i=1}^p B_i Y_{t-i} + \varepsilon_t \quad (2)$$

The Choleski decomposition has been used in the identification process, and we have used the method of Peersman and Smets (2001) in the choice of the order of introduction of variables. Under this method, there must be descending order exogeneity variables. The most exogenous variable (which will be introduced at the beginning) is that only responds to its own shock and is not influenced by other shocks. And the most endogenous variable (which will be introduced at the end) is that which responds to all shocks affecting the system. This method allows us to decompose the matrix *A* into a lower triangular matrix. Therefore, retained the order of the variables is as follows: the terms of trade, foreign real GDP, the domestic real GDP, the real effective exchange rate and the consumer prices index.

The matrix form of the SVAR model can be expressed as follows:

$$\begin{bmatrix} dLTT_t \\ LFGDP_t \\ LRGDP_t \\ LERRER_t \\ dLCPI_t \end{bmatrix} = A(L) \times \begin{bmatrix} \varepsilon_{dLTT_t} \\ \varepsilon_{LFGDP_t} \\ \varepsilon_{LRGDP_t} \\ \varepsilon_{LERER_t} \\ \varepsilon_{dLCPI_t} \end{bmatrix}$$

Where the left side of the equation contains endogenous variables and *A(L)* is a squared matrices of coefficients associated with lagged variables and structural shocks through the column vector [ε]. The identification of structural shocks required by Blanchard and Quah (1989), the imposition of long-term economic constraints which are presented in the matrix noted *A* (*I*). Following the method of Blanchard and Quah (1989), the identification of the system requires the imposition of $n(n-1)/2$ constraints. In our model, we will impose 10 constraints. Constraints

of normalization and independence of structural innovations here are fifteen in number and economic theory should be able to ask the ten remaining constraints:

The assumption of a small open economy can assume that domestic shocks do not affect external variables that are the terms of trade and foreign real GDP (six constraints zeros in the North-East quadrant of the matrix $A(I)$). The second type of restrictions corresponds to zeros in the South-East quadrant matrix $A(I)$. Demand shocks generated by the real exchange rate and the consumer price index cannot permanently affect the level of economic activity (a_{34} and $a_{35} = 0$). Concerning foreign GDP, this variable may be affected by foreign supply shocks only ($a_{12} = 0$). Finally, the last constraint ($a_{45} = 0$) allows us to identify a nominal shock which does not affect the level of exchange rate in the long term.

Thus, the presentation of the matrix $A(I)$ long-term constraints as follows:

$$\begin{pmatrix} a_{11} & 0 & 0 & 0 & 0 \\ a_{21} & a_{22} & 0 & 0 & 0 \\ a_{31} & a_{32} & a_{33} & 0 & 0 \\ a_{41} & a_{42} & a_{43} & a_{44} & 0 \\ a_{51} & a_{52} & a_{53} & a_{54} & a_{55} \end{pmatrix}$$

II.2. Empirical analysis: data and estimation results

We report in this section presents our main empirical results from the Structural VAR model for the main macroeconomic variables in Tunisia. The discussion focuses on the relative importance of external and domestic shocks in output fluctuations, the real effective exchange rate fluctuations, and prices fluctuations, through the decomposition of the variance, as well as dynamic adjustment, summarized by impulse responses.

II.2.1. Data sources

The study period extends from 1970 to 2009, and observations are annual. Data on domestic real GDP, the real effective exchange rate, consumer prices index and terms of trade are obtained from the database of the World Bank WDI 2011. For foreign real GDP, bilateral export data that have been used in its construction came from the database Chelem 2011.

II.2.2. Estimation Results

The sources of output growth fluctuation are shown for Tunisia in table 1. Domestic shocks explain the main important part of output fluctuation in this country. In addition, terms of trade and foreign demand shocks have an important impact on output growth movements.

Concerning domestic shocks, those emanating supply shocks seem to predominate over the demand shocks. These results are in agreement with literature evidence on the importance of

supply shocks as a source of macroeconomic fluctuations for developing countries (see Hoffmaister, Roldos (1997), Hoffmaister, Roldos and Wickam (1998)).

Table 1. Variance Decomposition of Real Domestic Output

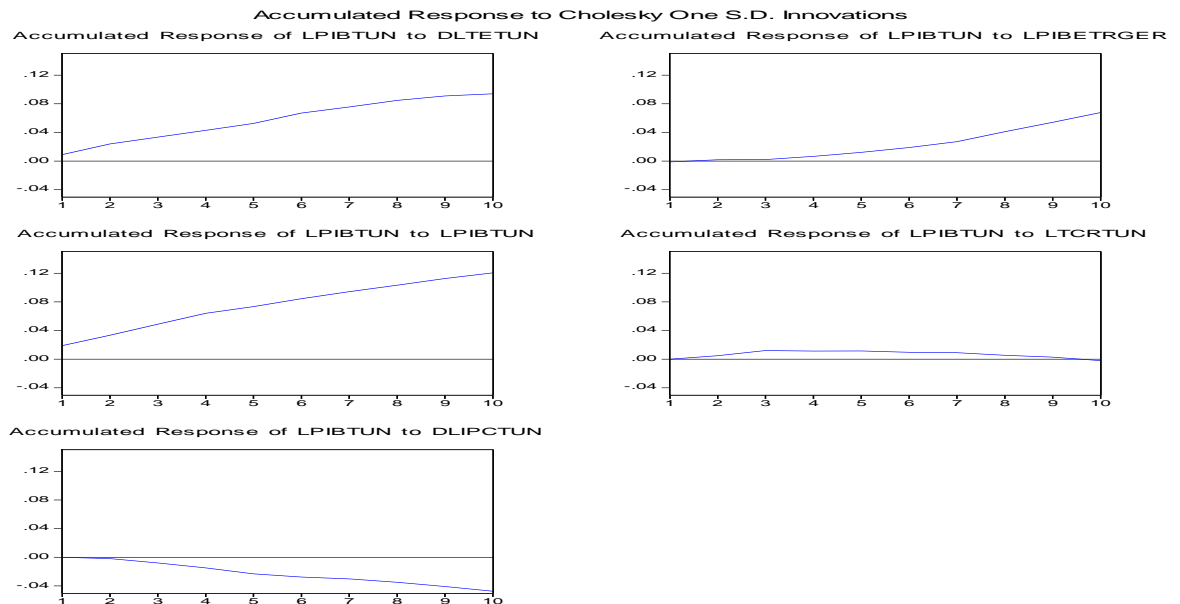
Years	Terms of trade shock	Foreign demand shock	Supply shock	Real demand Shock	Nominal demand Shock
1	18.39	0.35	81.24	0.00	0.00
2	33.43	1.189	62.47	2.52	0.37
3	29.76	0.82	60.68	5.71	3.00
4	28.26	1.76	60.39	4.44	5.13
5	28.83	3.10	56.34	3.82	7.88
6	32.79	4.47	52.00	3.32	7.40
7	32.52	6.61	50.84	3.03	6.97
8	31.11	12.11	46.88	3.07	6.80
9	29.11	15.98	44.79	2.95	7.14
10	26.78	19.63	42.52	3.34	7.70

Source: Author estimates.

The dynamics of adjustment of output are shown in figure 1. The impulse responses have the expected sign and confirm the relative importance of the different shocks to output fluctuations. The adjustment of output to supply, terms of trade shocks and foreign demand appears to be consistent with the model. In the long run, a favorable supply shock leads to an output expansion of about 0,744 percent. Response functions show that both favorable terms of trade shocks and the foreign demand shocks, have the effect of improving the level of economic activity in Tunisia. A positive shock in terms of trade yields an expansion of output of about 0.56 percent and a positive shock of foreign demand leads to an output expansion of about 0.16 point.

The analysis of response functions to shocks confirms that nominal demand shocks and real demand shocks have a limited impact on the economic growth. Indeed, the impact of a monetary policy shock is no significant and it is almost zero during the first three periods. From the fourth period, we find that the cumulative effect has a negative sign, suggesting that a positive demand shock leads to a nominal decline in real output. This result is not intuitive because usually a nominal shock generates positive economic expansion. This result is not of great importance given the low contribution of nominal demand shock to variability of domestic real GDP. In addition, this result could be explained by the decrease in consumption resulting from the price increase due to the monetary impulse.

Figure 1. Impulse Responses of Real Domestic Output



Source: Author estimates.

Similarly, the impact of a shock on the real exchange rate effective on the variability of real GDP is low. When the nature of the effects of this shock, we find that the cumulative effect is very small and positive sign. This analysis shows us that policy shocks such as monetary shock or real demand shock does not explain a significant variability of real GDP.

About the effective real exchange rate movements, they are driven mostly by domestic shocks; in particular, real demand Shocks assimilated to a fiscal shock, both in the short and long run, explaining about 40 percent of the movements of the real exchange rate. Nominal shocks explain a much smaller estimated share of such movements (see table 2). External shocks play also a larger role to explain these movements, explaining about 50 percent of these movements.

These results suggest that essentially changes in fiscal policy stance and external shocks are the most important determinant of the real exchange rate in Tunisia.

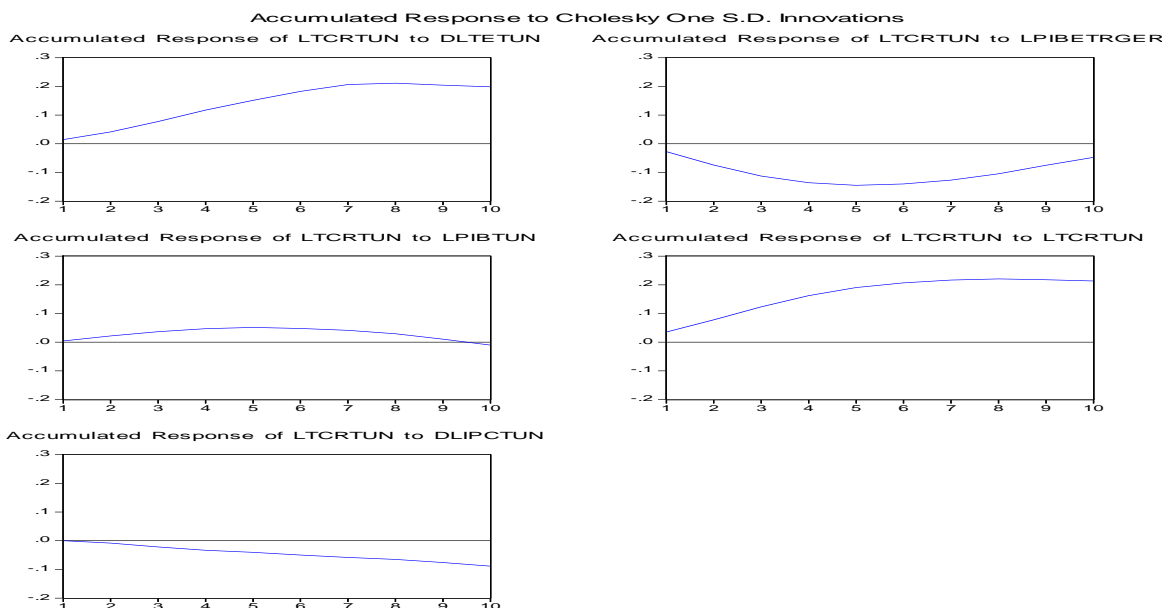
Through the examination of response functions of the real exchange rate, the following points can be highlighted (Figure 2). First, an expansionary fiscal shock in Tunisia leads to a real depreciation of about one percent. Economic theory states that following a positive shock such as worsening budget deficit, there is an upward pressure on prices, which leads to an appreciation of real exchange rate and worsening external position (external deficit). However, adjustments to the value of the dinar in the context of structural adjustment programs during the eighties have resulted in a real depreciation of the dinar. Second, a favorable foreign demand shock leads to a real appreciation of 0,33 percent; that is, the real exchange rate adjustment occurs gradually. A positive terms of trade shock leads to a gradual real depreciation, which is equivalent to approximately to about 0,4 percent in the long run.

Table 2. Variance Decomposition of Effective Real Exchange Rate

Years	Terms of trade shock	Foreign demand shock	Supply shock	Real demand Shock	Nominal demand Shock
1	9.37	33.71	0.91	55.99	0.00
2	12.73	40.01	4.38	41.90	0.96
3	17.90	35.17	4.32	40.62	1.97
4	23.30	30.09	3.92	40.32	2.34
5	26.92	27.12	3.59	39.99	2.35
6	29.89	25.41	3.42	38.63	2.63
7	31.27	25.09	3.48	37.29	2.85
8	30.33	26.50	4.03	36.14	2.97
9	28.65	28.76	5.30	33.96	3.30
10	27.17	30.20	6.75	32.09	3.76

Source: Author estimates.

Figure 2. Impulse Responses of Real Exchange Rate



Source: Author estimates.

Concerning inflation, domestic shocks particularly nominal shocks that explain variations in the inflation rate in Tunisia during the sample period, although the external shocks also have a role. According to the results, domestic demand shocks explain about 35 percent on average. The evidence for other domestic shocks suggests that they play a marginal role in explaining price changes. It is clear from our results that also external shocks, particularly those of the terms of trade have a significant effect, accounting for about 36 percent of the price movements.

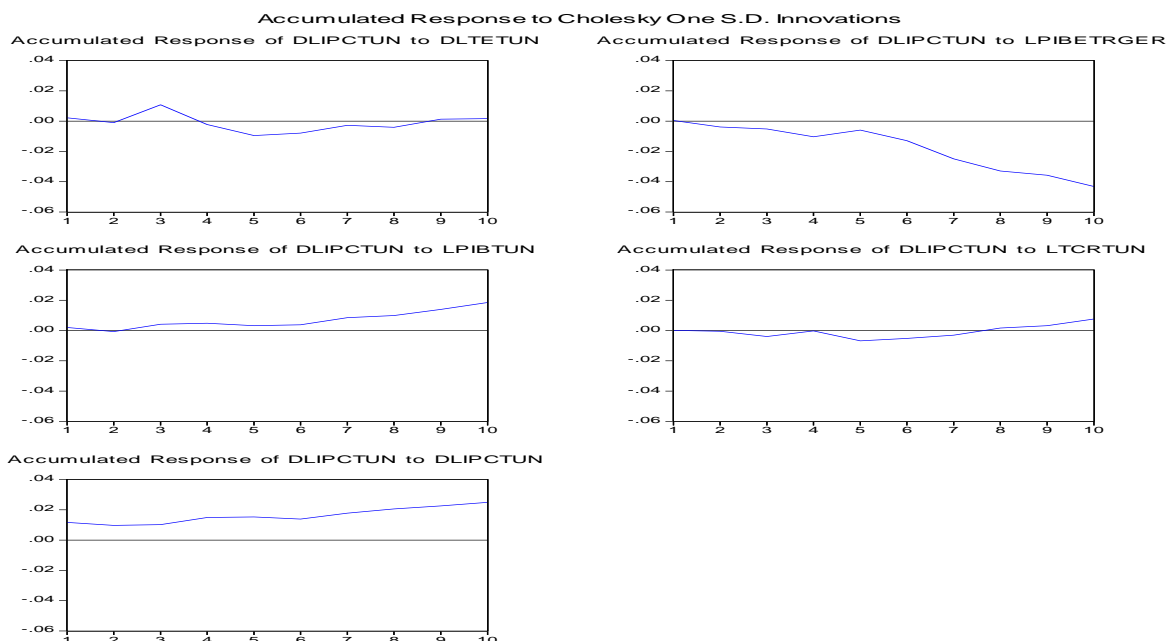
The dynamics of price adjustment are presented in Figure 3. Impulse responses have the expected sign and confirm the relative importance of the various shocks to price fluctuations. We find essentially that (1) the expansionary demand policies have an immediate impact on the price increases that are nearly half of the full long-term effect, which is drawn of more time, (2) a positive supply shock leads to a gradual increase in the price implying that the real appreciation that follows the shocks results from impact domestic prices fluctuations, and (3) a positive terms of trade shock seems to lead on impact to a temporary fall prices which returns to its original level.

Table 3. Variance Decomposition of Inflation Rate

Years	Terms of trade shock	Foreign demand shock	Supply shock	Real demand Shock	Nominal demand Shock
1	3.16	0.12	2.92	0.01	93.77
2	7.79	9.84	6.47	0.17	75.70
3	42.20	5.57	9.85	3.39	38.96
4	54.27	7.81	6.09	4.32	27.48
5	52.69	9.24	5.46	9.64	22.94
6	49.17	14.90	5.11	9.29	21.50
7	41.22	26.36	6.24	7.72	18.44
8	37.63	29.92	5.85	9.11	17.46
9	38.19	29.02	7.03	8.85	16.89
10	35.08	31.11	8.11	9.71	15.96

Source: Author estimates

Figure 3. Impulse Responses of Inflation Rate



Source: Author estimates.

II.2.3. Interpretation of Results

We interpret the strong contribution of real supply shocks in explaining the variability of economic activity in Tunisia amounts to several factors, including the effects of natural shocks. Indeed, the changing climatic conditions have a strong impact on domestic GDP fluctuations: there have been years of good rainfall alternating with years of drought, including droughts of 1988-1989, 1994-1995 and new drought periods between 1999-2002. Agriculture has a significant impact on performance but unstable economic growth in Tunisia.

Low contribution of economic policy-based impulses (fiscal shock, the exchange rate adjustments and monetary shocks) reflects the decision makers concerned with stability, mainly since the adoption of the Structural Adjustment Programme in the early 1980s. Indeed, the control of public spending, monetary aggregates and the exchange rate adjustments aim to restore internal and external equilibria, and defend the value of the national currency and ensure its stability. The Central Bank has the desire to control the inflationary pressures and no longer shares directly responsible for the growth.

The predominance of nominal and real domestic demand shocks in explaining prices and fluctuations in exchange rates may be due to the broad guidelines of economic policy. These are policy makers who ensure price stability in Tunisia applying a rigor in creating money independently of serious research for adequate financing of economic growth. In addition, adjustments to the nominal exchange rate since the eighties may partly explain the evolution of the real exchange rate. With regard to external shocks, the significant impact of terms of trade on key macroeconomic variables back to the strong opening of the Tunisian economy and its relatively small size. Prices of exports and imports are those generally determined abroad. This analysis allows us to conclude that Tunisia is heavily any variation in prices of goods exported and imported that Tunisia is a price taker. In addition, the high concentration of Tunisian exports on a limited number of products, leaving Tunisia exposed to large variations in the terms of trade.

Finally, Strong trade liberalization in Tunisia that the variation of the foreign import demand influences economic growth. Tunisian exports largely dependent on import demand in European countries, the Tunisian economy makes it sensitive to the negative effects of the slowdown in demand from partners for its products. In addition, strong competition from countries such as the Asian countries and Turkey on the European market threat Tunisian exports to Europe.

III. Implications for the conduct of economic policy in Tunisia

Through the results obtained, several economic policy recommendations can be drawn: The strong contribution of supply shocks on the variability of economic activity in Tunisia which primarily reflect the significant impact conditions on the activity requires the diversification of the productive sector in Tunisia. The agricultural sector cannot sustain economic growth alone saw its dependence on climatic conditions. Indeed, this sector is affected by the adverse effects of drought. To overcome these adverse effects, measures to manage these effects must be taken. Among these measures, we must think about the conservation and use of water resources in an optimal way.

The results suggest that the contribution of nominal demand shocks and real demand to real GDP is limited: the contribution of an appropriate fiscal adjustment to support growth is necessary. The government intervention is necessary to upgrade the Tunisian company by providing all necessary means. The State must also provide incentive efforts and guidance of investors to exploit new sectors to diversify its economy and reduce its.

For policy change, we know that the evolution of exports depends on their competitiveness relative to quality and price of foreign competitors. This demonstrates the important role of the exchange rate. Indeed, it is according to this rate as domestic prices are converted into foreign currencies. The Tunisian authorities have conducted the devaluation of the exchange rate in order to make Tunisian products competitive and boost exports. Overvaluation may hinder the competitiveness of exports. Therefore it is essential to avoid the dinar become overvalued in order to maintain the growth and diversification of our exports. In addition, the measures related to non-price competitiveness can also improve the quality of produce for export and more efforts in research and development.

Concentration of Tunisian exports to countries in Europe makes the Tunisian economy more vulnerable to external shocks. The slowdown in global growth mainly that of the European Union and the occurrence of crises in these countries, affecting the Tunisian economy especially in terms of exports. Indeed, the high trade openness of Tunisia makes this economy largely dependent on import demand from its European partners. Thus, a decrease in the demand for imports may affect economic growth. For that Tunisia must devote efforts to diversify export destinations. Many of these destinations are insufficiently exploited by Tunisian exporters. We can cite the case of Asian countries, the Middle East and North Africa (MENA) and those of Sub-Saharan Africa. In fact, transactions with these countries are still limited.

In order to limit the negative effects of the deterioration of terms of trade on the Tunisian economy, export diversification is recommended. This diversification may limit the negative impact of lower prices of exported goods.

IV. Conclusion

The objective of this study was to identify the sources of macroeconomic fluctuations in Tunisia and to determine the contribution of the different internal and external shocks which can explain key variables movements in this country.

The analysis of movements focused on the examination of these variables (Real domestic GDP, Effective Real Exchange Rate and Inflation Rate) over the period 1970-2009.

Our results highlight the important contribution of domestic shocks mainly real supply shocks in explaining the variability of economic activity. In addition, our results also show that external shocks explain a significant contribution to economic fluctuations in Tunisia. The contribution of domestic shocks in the long run is more important than the external shocks. This shows that the main aggregates in Tunisia have greater sensitivity in the long-term domestic shocks. In fact, they contribute about 61% of the variance decomposition of the domestic real GDP. Also, due to external shocks explain 39% of the fluctuations in economic growth. External shocks have had a greater impact on the real exchange rate and inflation in Tunisia.

In light of the results obtained, we conclude that it is imperative to manage domestic shocks such as real supply shocks, appropriate adjustments to the exchange rate and fiscal shocks to achieve a stable and sustained growth in Tunisia. In addition, given the importance of external shocks and great opening Tunisia to the world economy, it is necessary to consider also solutions: the diversification of Tunisian products is recommended in order to limit the negative

impact of deteriorating terms of trade. The high trade openness Tunisia on the European center and its dependence vis-à-vis the import demand from major trading partners increases vulnerability to external shocks Tunisia. Thus, a shock that appeared in Europe can be transmitted to this economy. To do this, Tunisia should diversify its trading partners and explore new markets such as the Arab, African and Asian countries such as India or China. Indeed, Tunisia's trade with these countries is still limited.

References

- 1- Agénor P., Dermott M. and Prasad E. (1999), "Macroeconomic fluctuations in developing countries: Some stylised facts". *IMF working papers WP/ 99/ 35*.
- 2- Broda C. (2004), "Terms of trade and exchange rate regimes in developing countries". *Journal of International Economics*, 63 (2004) 31–58.
- 3- Bruno C. and De Band O, (1999), "La modélisation VAR structurelle : application à la politique monétaire en France". *Economie et prévision*, N°137/1.
- 4- Buckle R., Kim K. and Mclellon N, (2002) "A structural VAR models of New Zeland Business Cycle". New Zeland treasury. *WP 02/26*.
- 5- Dungey M. and Fry R, (2001), "A Multi-Country Structural VAR Model". WP, n° 2001-04, *Australian National University*.
- 6- Gerlach P. (2005), "Internal and external shocks in Hong Kong: Empirical evidence and policy options". *Economic modeling*, 23 (2006) 56-75.
- 7- Giannini C. (1992), "Topics in Structural VAR Econometrics. in *Economics and Mathematical Systems*. Springer-Verlag, Heidelberg.
- 8- Giannini C., Lanzarotti A. and Seghelini M, (1995), "A Traditional Interpretation of Macroeconomic Fluctuations: The Case of Italy". *European Journal of Political Economy*, vol.11, p.131-155.
- 9- Hirata H., Kim H . Sunghyun and Kose, M. A, (2007), "Sources of Fluctuations: The Case of MENA". *Emerging Markets Finance and Trade*. 43(1) 5-34.
- 10- Hoffmaister A.W. and Roldos J.E, (1997), "Are Business Cycles Different in Asia and Latin America? ". *IMF Working Papers*, WP/97/7.
- 11- Hoffmaister A.W., Roldos J.E and Wickman P, (1998), "Macroeconomic Fluctuations in sub- Saharan Africa". *IMF Staff Papers*, Vol.45.
- 12- Kandil M. (2000), "Macroeconomic Shocks and Dynamics in the Arab World" . *IMF and University of Wisconsin, Milwaukee, Working Paper*.
- 13- Mehrara M. and Oskoui K, (2007), "The sources of macroeconomic fluctuations in oil exporting countries: A comparative study". *Economic Modelling*, 24 (2007) 365–379.
- 14- Rebucci A. (1998), "External Shocks, Macroeconomic Policy and Growth: a Panel VAR Approach". *Global Economic Institutions Working Paper Series n° 40, Economic and Social Research Council*.
- 15- Robert A., Buckle A., Kim B., Kirkham Nathan A., Lellan A. and Jarad S, (2007), " A structural VAR business cycle model for a volatile small open economy". *Economic modelling* 24, (2007) 990–1017.
- 16- Ziky M. (2005), " contribution des chocs internes et externes aux fluctuations macroéconomiques au Maroc : une approche structurelle des VAR". *ERF Twelve conference. Decembre 2005*.

17-Ziky M., Mansouri B, (2003), "The role of openness in transmitting external shocks affecting the Moroccan economy: analytical and empirical approaches". *10th ERF*. December 2003.

Appendix

Table 1: Unit Root Tests

	Series in Levels	Series in 1 st Differences	Test results
<i>RGDP</i> <i>ADF</i> <i>PP</i> <i>KPSS</i>	-4,295* -4,407* 0,131		I(0)
<i>CPI</i> <i>ADF</i> <i>PP</i> <i>KPSS</i>	-1,90 -2,759 0,246*	-4,00* -6,631* 0,432	I(1)
<i>RER</i> <i>ADF</i> <i>PP</i> <i>KPSS</i>	-1,71*** -2,27* 0,126		I(0)
<i>TT</i> <i>ADF</i> <i>PP</i> <i>KPSS</i>	-2,92 -1,879* 0,185*	-7,686* -3,922 0,243	I(1)
<i>FGDP</i> <i>ADF</i> <i>PP</i> <i>KPSS</i>	2,68*** -2,97* 0,192		I(0)

(*),(**) and (***) indicate rejection of the null hypothesis at 5, 1 and 10 percent levels of significance respectively.