



Munich Personal RePEc Archive

Testing Export-led Growth in Tunisia and Morocco: New Evidence using the Toda and Yamamoto procedure

Hamdi, Helmi

Cergam CAE- Aix-Marseille University

January 2013

Online at <https://mpra.ub.uni-muenchen.de/65072/>
MPRA Paper No. 65072, posted 16 Jun 2015 19:02 UTC

Testing Export-led Growth in Tunisia and Morocco: New Evidence using the Toda and Yamamoto procedure

Helmi HAMDJ
CERGAM-CAE Aix Marseille University

Abstract

This paper examines the export-led growth hypothesis in Tunisia and Morocco using a multivariate time-series framework. The two selected countries present an interesting case study in terms of their growing outward orientation and adoption of export promotion policies as part of their growth priorities. Since the eighties, both countries have integrated themselves into the world economy and have continuously improved their growth prospects. As a result, they have experienced an outstanding economic performance during the past decade. Despite the multiple similarities between Morocco and Tunisia; our empirical model based on the Toda and Yamamoto (1995) procedure reveals two conflicting results. Firstly, there is evidence for export-led growth in Tunisia while the results for Morocco reveal an import-led growth policy oriented. Secondly, results show no evidence of bidirectional causality between imports and exports for both countries. Therefore, new structural reforms are needed for the two countries to benefit from their high trade openness and from their trade partners.

Key words. Export- Growth- Tunisia-Morocco- Toda and Yamamoto

1. Introduction

In the literature, numerous studies have been carried out to test the validity of the export-led growth (ELG henceforth) hypothesis for different countries by the use of different econometric procedures. The empirical results have produced mixed and conflicting results on the nature and direction of the causal relationship between exports and economic growth. Despite the existence of huge amounts of studies on the relationship between trade and growth, the topic remains till this day on the schedule of the researchers, scholars and policy makers as well. This study attempts to provide new evidence for export-led growth hypothesis regarding Tunisia and Morocco. The two selected countries present an interesting case study for several reasons. First, they have numerous identical socioeconomic and geographic characteristics¹. Second; both countries are considered among the best students of the Middle East and North Africa (MENA henceforth) countries in terms of the improvement of their trade policy and strategy. In fact, Tunisia and Morocco have recorded outstanding economic performance since the 20s and they have become among the most open economies in the MENA region. Since their independence from the French colonial (1956 for both Tunisia and Morocco) both countries have changed their economic perspective from central planning and government intervention to one based on a free market economy. The adoption of major structural reforms was accelerated in the eighties with the reinforcement of the openness process and restructuration and the liberalization of their financial and economic sectors. They adopted the Structural Adjustment Programs (SAPs) very early compared to other MENA counties (1983 for Morocco and 1986 for Tunisia). They also adhered to the General Agreement on Tariffs and Trade (GATT henceforth) in late eighties (1987 for Morocco and 1989 for Tunisia) and to the World Trade Organization (WTO henceforth) in 1994 for both of them. The openness was accelerated with the signature of multiple accords with the European Union in 1995 for Tunisia and 1996 for Morocco as European Union has become the major trading partner for both countries (73.18% for Tunisia and 72% for Morocco).

¹ The Geographic localization of the two countries is the same (North Africa); they have similar history, the same religion, the same language and similar economic partners. Moreover the structure of their GDP is very similar and the rate of growth is also identical since the previous decade.

Interestingly, the degree of openness of Tunisia moved from 34.2% in 1997 to 107.33% in 2009 and similarly for Morocco, it shift from 43.5 % in 1997 to 68.08 % in 2009 (African Development Bank, 2012). Moreover; both countries have become the preferred destination of European enterprises (African Development Bank, 2011). Given the progress and the performance of the two countries, they are now competing to provide the most attractive environment for foreign investors and they are also competing to ensure better political stability, sound economic policies, a modern and well developed infrastructure and a highly qualified workforce.

According to what is described above, it is hence interesting to investigate whether similarities in socioeconomic indicators and economic performance means there are similarities in strategies and policies or not. Moreover, it is also interesting to evaluate whether all the efforts undertaken by the Tunisian and Moroccan governments are fruitful of their economic growth or not. This paper contributes to enrich the available literature but it differs from the earlier works in several important respects. First, unlike other papers which have used bivariate analysis for the MENA region², we explicitly account for imports as a third variable when testing for the causal relationship between exports and economic growth. According to Musleh-ud Din (2004) the explicit incorporation of imports in the analysis allows their role in the export-economic growth relationship³. Second, contrary to previous studies, our paper uses recent data for both countries which covers the period 1961-2011. Third, because of the probable shortcoming of specification bias and spurious regression; in this paper we do not perform the basic Granger-Causality test to analyze the relationship between exports, imports and economic growth but improved the Granger causality method instead. This is done by the use of the Toda and Yamamoto (1995) procedure. To the best of our knowledge; this technique has never been used for either one of these countries or for the MENA region. The advantage of using the Toda and Yamamoto procedure is that it improves the power of Granger-causality test (Rimbaldi and Doran 1996).

² Marshall (1985), Hutchinson and Singh (1992), Dodaro (1993), Reizman *et al.* (1996), Pompino (1996), Abual-Foul (2004). See Husein (2010) for more details.

³ According to Gujarati (1995) a two-variable causality test without considering the effect of other variables is subject to possible specification bias. A causality test is sensitive to model specification and the number of lags. It would reveal different results if it was relevant and was not included in the model. Therefore, the empirical evidence of a two-variable Granger-causality is fragile because of this problem.

Moreover; this procedure makes parameter inference valid even when VAR system is not cointegrated. Our empirical analysis shows that despite similarities between the two countries; the results are conflicting. While Tunisia shows evidence of export-led growth; Morocco presents evidence of imports-led growth.

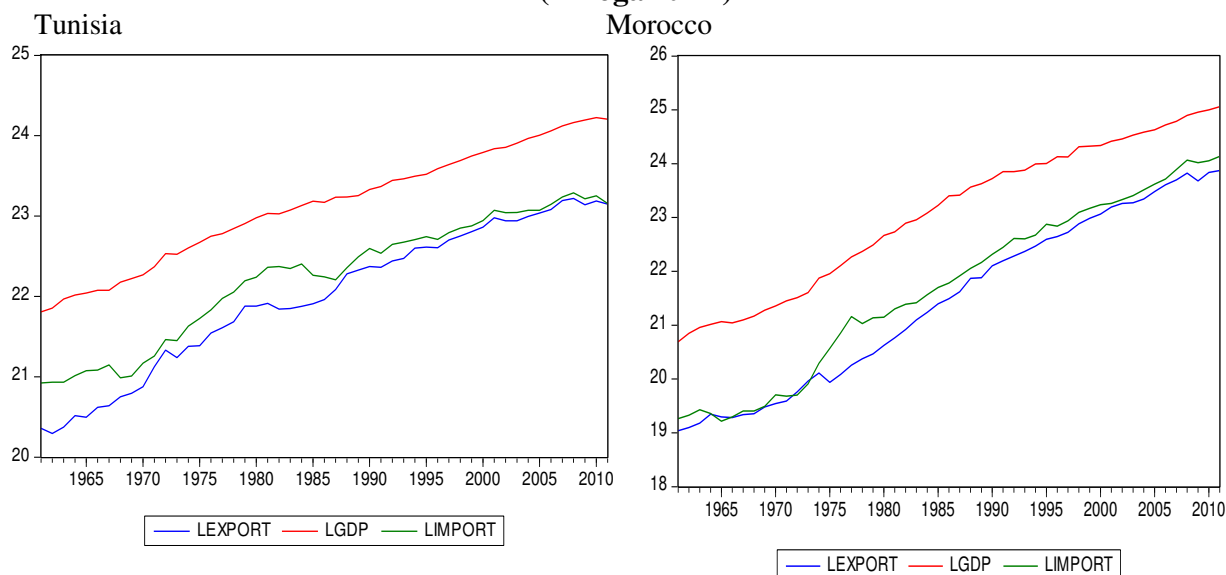
The remainder of the paper is as follows. Section 2 present data and methodology; section 3 provides empirical results and finally section 4 concludes.

2. Data and methodology

2.1. Data

We consider the following three variables: real gross domestic product, real total exports and real imports. The sample used includes Morocco and Tunisia for the annual time series from 1961 to 2011. The main source of our data is the World Bank’s World Development Indicators (WDI). Real GDP, real exports and real imports are all transformed into log form to reduce the problem of heteroscedasticity as it compresses the scale in which the variables are measured, thereby reducing a tenfold difference between two values to a twofold difference (Gujarati, 1995). The logarithmic plots of the time series are shown in Figure 1.

Fig 1. Evolution of GDP, real export and real import in Tunisia and Morocco since 1961 (In logarithm)



Source: WDI (2012)

This figure above illustrates that individually the real GDP, the real exports and the real imports of each country show strong upward trends implying that these variables may move together.

2.2. Econometric approach

2.2.1. Unit root testing

The first step is to test whether the variables contain a unit root to confirm the stationarity of each variable. This is done by using the Augmented Dickey–Fuller (F-ADF) unit root tests. Considering the low power of the ADF tests, we also use the Phillips-Perron (PP) test (1988), which takes into account for possible correlation in the first differences of the time-series using a nonparametric correction and allows for the presence of a non-zero mean and a deterministic time trend.

2.2.2. Toda and Yamamoto

Several Granger causality tests have been developed in the literature including: Granger causality test, MWALD tests by Toda and Yamamoto (1995), Error Correction Model, etc. Broadly, Granger causality is applicable if the underlying series data are stationary and it requires the series to be integrated. Otherwise, it could give spurious regression results and the F -test becomes invalid. Regarding ECM (Engle and Granger 1987) and VECM models (Johansen and Juselius 1990) which are considered as alternatives for the testing of non-causality between economic time series, they appear to be burdensome and they require several steps. According to Toda and Phillips (1993) the results of the standard Granger causality tests in ECMs could be of incorrect inference and could suffer from nuisance parameter dependency asymptotically in some cases. To avoid these problem, Toda and Yamamoto (1995) propose a method that is used to estimate unrestricted VAR by the use of a Modified Wald test for restrictions on the parameters of the VAR (k) model and estimates a VAR [$k+dmax$], where k is the lag order of VAR and $dmax$ is the maximal order of integration for the series in the system. The advantage of this procedure is that it does not require knowledge of cointegration properties of the system.

Arithmetically, the multivariate framework of our case study can be expressed as follows:

$$\ln GDP_t = \alpha_1 + \sum_{i=1}^{k+d \max} \beta_{1i} \ln GDP_{t-i} + \sum_{i=1}^{k+d \max} \beta_{2i} \ln Import_{t-i} + \sum_{i=1}^{k+d \max} \beta_{3i} \ln Export_{t-i} + \mu_{1t} \quad (1)$$

$$\ln Import_t = \alpha_2 + \sum_{i=1}^{k+d \max} \beta_{2i} \ln GDP_{t-i} + \sum_{i=1}^{k+d \max} \beta_{2i} \ln Import_{t-i} + \sum_{i=1}^{k+d \max} \beta_{2i} \ln Export_{t-i} + \mu_{2t} \quad (2)$$

$$\ln Export_t = \alpha_3 + \sum_{i=1}^{k+d \max} \beta_{3i} \ln GDP_{t-i} + \sum_{i=1}^{k+d \max} \beta_{3i} \ln Import_{t-i} + \sum_{i=1}^{k+d \max} \beta_{3i} \ln Export_{t-i} + \mu_{3t} \quad (3)$$

Where LnGDP is the logarithm of real gross domestic product; LnImport is the logarithm of real imports and LnExport is the logarithm of real exports. To summarize the theoretical framework, the Toda-Yamamoto method is performed in two steps. The first step consists of determining the lag length (k) of VAR model and the maximum order of integration (d) of the time series variables in the system. After the selection of optimum lag length VAR (k) and the order of integration $dmax$, a level VAR is estimated with a total of $[k+dmax]$ lags. The second step requests the application the standard Wald tests on the first (k) VAR coefficient matrix to make Granger causal inference using a chi square (χ^2) distribution.

3. Empirical results

3.1 Unit root tests

Table 1 reveals the results of the unit root tests of the Augmented Dickey-Fuller (*ADF*) and Phillips-Perron (*PP*) for *LGDP*, *LImport*, and *LExport* for Morocco and Tunisia. The test statistics for the log levels of GDP, Imports and Exports are statistically insignificant. When we apply the unit root tests to the first difference of all variables, both tests reject the joint null hypothesis for each variable at the 1 per cent level. Thus, from all of the tests, the unit roots tests indicate that each variable is integrated of order one.

Table 1. Unit root tests

	ADF		PP		Order of Integration
	level	1st diff,	Level	1st diff,	
Tunisia					
LGDP	-2.011645	-7.056304***	-2.207185	-7.056217***	I(1)
LImport	- 1.418876	-6.127354***	-1.359032	-6.193159***	I(1)
LExport	-1.731847	-7.310579***	-1.942305	-7.310579***	I(1)
Morocco					
LGDP	-1.514459	-7.600650	-1.547534	-7.439822	I(1)
LImport	-0.197829	-5.405683	-0.246080	-5.382334	I(1)
LExport	-0.133100	-7.485509	-0.122973	-7.486194	I(1)

Note: This table presents the results of the unit root tests of the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) for LGDP, LImport and LExport for Morocco and Tunisia.

The regressions in first difference include intercept.

*** Denotes the rejection of the null hypothesis at 1% level of significance

Before performing the Granger causality procedures it is important to determine the order of integration of the series ($dmax$) and the optimal lag length k , in order to avoid spurious causality or spurious absence of causality⁴ (Clark and Mirza, 2006). The result of selecting optimal lag length of VAR indicates that lag order of VAR (k) is 2 for both Morocco and Tunisia, for multivariate VAR.

After determining the optimal lag length, the next step is to augment the VAR by the maximum order of integration of the series ($dmax$) and then performing the non-Granger causality tests.

3.2. The Granger non-causality tests

In order to examine the direction of causality we apply the Toda and Yamamoto (1995) procedure which, as mentioned above, provides valid inference in the context of unstable, possibly cointegrated systems. The results of these tests are presented in Table 2.

⁴To determine optimal lag length of VAR system, the sequential modified LR test statistic (LR), Final prediction error (FPE), Akaike information criterion (AIC), Schwarz information criterion (SC) and Hannan-Quinn information criterion (HQ) lag selection criteria are used.

Table2. Results of the TY estimation

	LGDP	LImport	Lexport
Tunisia			
LGDP	-	0.501523	3.270412
LImport	0.299457	-	29.12841***
LExport	4.447358*	1.031796	-
Morocco			
LGDP	-	6.127557**	4.721783*
LImport	9.723594***	-	0.593942
LExport	1.009157	1.451346	-

Note. This table presents the results of the Toda and Yamamoto (1995) Granger non causality tests.

Table 2 shows that the null hypothesis “Granger no-causality from exports to growth” can be rejected at the 10 percent level of significance for Tunisia. However, the reverse result is not true. Therefore, there is no evidence of bidirectional relationship between the two variables but the export-led growth hypothesis is valid. This result joints the same findings of previous studies of Reizman *et al.* (1996) but differs to the finding of Jung and Marshall (1985), Hutchinson and Singh (1992), Dodaro (1993) and Abu-Qarn and Abu-Bader (2005)⁵ where they found no evidence of causality between GDP growth and growth of real exports in the case of Tunisia⁶. Results also reveal that “Granger no-causality from imports to exports” can also be rejected at the level of 1 per cent of significance. This means that more imports may increase the exports which in turn contribute to economic growth. This scenario seems to be in line with the reality because the increasing number of foreign enterprises working in Tunisia and the increasing inward of capital flows and foreign direct investment. In reality, foreign enterprises import their primary materials; they produce goods and services (output) with the Tunisian labor force and then they export their products. This policy seems to be fruitful for the economic growth of the country. Results from Table 2 also show that GDP does not Granger causes exports. This result is

⁵ Abu-Qarn and Abu-Bader (2005) have used a cointegration analysis and ECM model for nine MENA countries. The time series data for Morocco is from 1963 to 1999 and from 1963 to 1998 for Tunisia.

⁶ All these studies are performed different econometric procedure with two variables only: real exports and real GDP.

contrary to the findings of Pomponio (1996) and Xu (1996)⁷ where they found evidence of growth-led exports in Tunisia.

Turning now to the case of Morocco; Table 2 shows that the null hypothesis “Granger no-causality from exports to growth” can be accepted which means that exports did not Granger cause economic growth in Morocco. This result joints similar conclusions of Xu (1996) and Abu-Qarn and Abu-Bader (2005) and differs from the recent study of Husein (2010). However, table 2 reveals that the feedback effect of ELG is true. This means that growth-led exports hypothesis is valid for Morocco. Table 2 also shows that the null hypothesis “Granger no-causality from imports to growth” can be rejected at the 1 percent level of significance. Moreover, the null hypothesis “Granger no-causality from growth to imports” can also be rejected at the 5 percent level of significance. Thus, this indicates the presence of a bidirectional causal relationship between imports and growth for the case of Morocco. This result reveals that Morocco is still relying on the imports of items, good and services to promote the development of its manufacturing and industrial sectors. These sectors seem to play a crucial role in boosting the economy which in turn promotes exports. Finally, from Table 2 we can also conclude no evidence of significant causality between imports and exports in Morocco.

4. Conclusion

The purpose of this study was to test the applicability of the export led growth (ELG) hypothesis for Tunisia and Morocco during 1961 to 2011. Thanks to trade policy reforms the two countries have achieved an outstanding economic performance during the past decade and they are becoming among the best students in the MENA region in view of their efforts in modernizing their economies and integrating in the world economy. Despite similarities between Morocco

⁷ Pompino (1996) used cointegration and error-correction model (ECM) for a panel of MENA countries and found support for unidirectional causality from output growth to exports, i.e., growth-led exports (GLE), in Algeria and Tunisia,

and Tunisia, empirical results show different findings. For Tunisia, the scheme could be summarized as follows:



This means the existence of a unidirectional causal relationship between imports and exports and another unidirectional relationship between exports and economic growth. Thus there is evidence of export-led growth for Tunisia.

For Morocco, the scenario is different; it could be summarized as follows:



The design reveals the existence of a bidirectional causal relationship between imports and economic growth. Thus, there is an evidence of import-led growth for the case of Morocco. Moreover, empirical results show the existence of a unidirectional causality between growth and export which validate the growth-led export hypothesis.

As we can see from the two schemes above, the two countries are still relying on imports of items, good and services to promote their growth prospects. Hence, policy makers should take into consideration of this conclusion and should adopt more structural reforms to enhance the productivities of manufacturing and industrial sector and to facilitate the export process by diversifying their partners and looking for new markets. As we saw in the introduction the exports to the European Union reach the 70% of the total exports for Tunisian and Morocco as well. This high ratio could harm the weight of the exports during a period of crisis⁸.

⁸ It is worth to mention that because of the European crisis, the degree of openness of Tunisia moved from 106% in 2008 to 87.5% in 2011.

References

- Abu-Bader, S. and Abu-Qarn, A. (2005), "The Validity of the ELG Hypothesis in the MENA Region: Cointegration and Error Correction Model Analysis," *Applied Economics*, 36, 1685- 95.
- Abual-Foul, Bassam, (2004), "Testing the Export-Led Growth Hypothesis: Evidence from Jordan", *Applied Economics Letters*, 11, 393-96.
- African Development Bank (2012) '*Tunisia*'. Document De Stratégie Pays. Intérimaire 2012-2013
- African Development Bank (2011) *Comparative study on export policies in Egypt, Morocco, Tunisia and South Korea*. 222 pages. BAD Tunis.
- Dodaro, S., (1993), "Exports and Growth: A Reconsideration of Causality", *Journal of Developing Areas*, pp: 227-244.
- Doran H E and Rambaldi A E (1996) Applying linear time-varying constraints to econometric models: With an application to demand systems. *Journal of Econometrics*. Volume 79, Issue 1, July 1997, Pages 83–95
- Granger, C. (1969). Investigating Causal Relationships by Economic Models and Cross Spectral Models. *Econometrica* 37, 424–438.
- Gujarati, D. (1995) *Basic Econometrics* (3rd edition). New York: McGraw-Hill.
- Hutchinson, M. and N. Singh (1992), 'Exports, Non-exports and Externalities: A Granger Causality Approach ', *International Economic Journal*, 6: 79–94 .
- Jung, S. W. and Marshall, P. J. (1985), "Macroeconomic Determinants of Economic Growth: Cross-Country Evidence," *Journal of Monetary Economics*, 16, 141-63.
- Musleh-UD Din (2004) Exports, Imports, and Economic Growth in South Asia: Evidence Using a Multivariate Time-series Framework *The Pakistan Development Review* 43 : 2 (Summer 2004) pp. 105–124
- Phillips, P. C. B., Perron, P., (1988), "Testing for a Unit Root in Time Series Regressions", *Biometrika*, pp: 335-346.
- Toda, H. Y., and P. Phillips (1993) Vector Auto Regressions and Causality. *Econometrica* 61, 1367–1393.
- Toda, H. Y., and T. Yamamoto (1995) Statistical Inference in Vector Autoregressions with Possibly Integrated Processes. *Journal of Econometrics* 66, 225–50.

Pomponio, X. Z. (1996), "A Causality Analysis of Growth and Export Performance," *Atlantic Economic Journal*, 24, 168-76.

Ramos F.F.R (2001) Exports, imports and economic growth in Portugal: evidence from causality and cointegration analysis. *Economic Modelling* 18 (2001) 613-623

Riezman, R. G., Summers, P. M., and Whiteman, C. H., (1996), "The Engine of Growth or its Handmaiden? A Time Series Assessment of Export Led Growth," *Empirical Economics*, 21, 77-113.

World Bank (2012). *World Development Indicators*: CD-ROM 2004. Washington, D. C.: The World Bank.

Xu, Z. (1996) On the Causality between Export Growth and GDP Growth: An Empirical Re-investigation. *Review of International Economics* 4:2, 172–184.