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Keywords: FDI, Economic growth; MENA countries; Toda-Yamamoto Granger non-causality.
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## Abstract

*This paper used time-series data to investigate the causal relation between foreign direct investment and economic growth in two MENA countries, namely Egypt and Jordan. The methodology used in this study follows Toda and Yamamoto (1995) procedure in order to test the Granger causality between economic growth and foreign direct investment. The empirical results reveal that only the FDI-led growth hypothesis exists in the case of both Egypt and Jordan.*

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## 1. INTRODUCTION

Foreign direct investment (FDI) has been considered as an important tool in promoting economic growth. However, there is still a debate on how the relationship is established between foreign direct investment and economic growth and what beneficial effects that FDI may bring to the hosting economies. Literature review shows that there is a general consensus among researchers and policy makers that foreign direct investment (FDI) supports economic growth through complementing the domestic investment by providing additional sources for capital and provides means of the know-how technology that most of developing countries lack. It also creates jobs and provides a channel through which firms in the host countries can enhance their knowledge and managerial skills through interactions with foreign firms. Thus, by recognizing the benefits and spillovers of foreign direct investment and their help in supporting the growth in their domestic economies, the host countries worked on providing the incentives to attract foreign direct investment.

However, empirical literature review shows that there is mixing results of the effect of foreign direct investment on the host countries. The debate shows that there are four hypothesis. These are: a) the FDI-Led Growth shows that FDI promotes economic growth in the economies of the host countries (see for example, among others, Alguacil et al. (2002); Li and Liu (2005); BAHARUMSHAH and THANOON (2006); Hsiao and Hsiao (2006); Beugelsdijk et al (2008); Tekin (2012); Gui-Diby (2014)), b) Growth-Led FDI which suggests that economic growth in the host countries attract FDI (see for example, among others, Mah (2010); Tekin (2012); Chan et al (2014)), c) Feedback ( bi-directional) relationship that FDI and economic growth causes each other (see for example, among others, Basu et al (2003) )), and d) No relationship that FDI and economic growth are not related (see for example, among others, Belloumi (2014); Herzer et al (2008); Temiz and Gökmen (2014); Yalta (2013)).

The major goal of this paper is to investigate the relationship between FDI and economic growth in two Middle Eastern & North African Countries (MENA), namely Egypt and Jordan. We use a newly developed procedure of Granger non-causality by Toda and Yamamoto (1995) to test for causality using time-series data for selected periods for those countries.

The rest of the paper is organized as follows. Section 2 describes, briefly, the data and the estimation methodology used while Section 3 presents the empirical results. Section 4 concludes the study.

## 2. DATA AND METHODOLOGY

To investigate the causal link between foreign direct investment and economic growth in the case of Jordan and Egypt, the paper will use annual data on gross domestic product per capita (GDPPC) (at constant 2005 US$), and Foreign direct investment (FDI): the ratio of net inflows to GDP. Data on GDPPC and FDI are extracted from the World Bank, World Development Indicators.

The methodology used in this study follows Toda and Yamamoto (1995) procedure in order to test the Granger causality between economic growth and foreign direct investment. As an advantage of this method, Toda and Yamamoto (1995) stated that “Our method is applicable whether the VAR’s may be stationery (around a deterministic trend), integrated of

arbitrary order, or cointegrated of an arbitrary order. Consequently, one can test linear or nonlinear restrictions on the coefficients by estimating a levels VAR and applying the Wald criterion, paying little attention to the integration and cointegration properties of the time series data in hand (Toda and Yamamoto (1995), p.227)". This procedure involves two steps. First, to determine the lag length (k) of the VAR model in levels and augment that with the maximum order of integration (dmax) of the variables used in the model. We used both Akaike Information Criterion (AIC) and Schwarz criterion (SC) to determine the optimal lag structure (k) of the VAR model. We also used the Augmented Dickey-Fuller (ADF) test to determine the order of integration (dmax) of the variables used in the model. Second, to test for Granger causality by using the modified Wald (MWALD) test in order to test the coefficients of the first k coefficients of the VAR (k+dmax). This test, according to this procedure of causality developed by Toda and Yamamoto (1995), has an asymptotic Chi-square distribution when a VAR (k+dmax) is estimated (given that dmax is the maximum order of integration that is suspected to occur in the system). Zapata and Rambaldi (1997) argued that the MWALD test requires no priori knowledge of cointegration or no cointegration of the system and it can be applied regardless of the order of integration (i.e., I(0), I(1), or I(2)) of the series as long as k>=1=d.

Here, let $Y_t$ be the natural logarithm of real GDPPC and $FDI_t$ be the ratio of foreign direct investment to GDP. Rambaldi and Doran (1996) have explained that the MWALD test used for testing Granger non-causality can be more efficient when using a Seemingly Unrelated Regression (SUR) method. Thus based on Toda and Yamamoto (1995) procedure, the Granger non-causality between economic growth and foreign direct investment can be tested using the following VAR system given in equations (1-2):

$$Yt = \alpha 1 + \sum_{i=1}^{k+dmax} \alpha 2iYt - i \; + \sum_{i=1}^{k+dmax} \alpha 3iFDIt - i + \varepsilon 1t \; \ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

$$FDIt = \beta 1 + \sum_{i=1}^{k+dmax} \beta 2iYt - i \; + \sum_{i=1}^{k+dmax} \beta 3iFDIt - i + \varepsilon 2t \; \ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

For example, when using Toda and Yamamoto (1995) approach to test the Granger non-causality from *FDI* to *Y*, we need to test the $H_0$: $\alpha_{3i} = 0$ for all $i \leq k$ in equation 1 and causality from *FDI* to *Y* can be established through rejecting the null hypothesis stated above. A similar procedure can be used to test the causality from *Y* to *FDI*, i.e., to test $H_0$: $\beta_{2i} = 0$ for all $i \leq k$ in equation 2 and causality from *Y* to *FDI* can be established if $\beta_{2i} \neq 0$ for all $i \leq k$.

## 3. EMPIRICAL RESULTS

Following Toda and Yamamoto (1995) method and before testing for the non-causality between economic growth and foreign direct investment, we need to establish the lag length (k) of the VAR model and the order of integration (dmax) of the variables used in the model. We used Schwarz Information Criterion (SC) to establish the lag length (k) of the VAR model in the case of each country (see Table 2). The ADF test was used to determine the order of integration (dmax) of the variables used. The ADF results given in Table 1 show that all the variables are integrated of order of one (i.e., *I(1)*).

**Table 1**
**ADF Unit Root Test**
(The null hypothesis: Y and FDI have a unit root)

| Country/Period | Variables | Level | First Difference |
|---|---|---|---|
| Egypt | | | |
| (1977-2013) | Y | -2.849249 (1) | -4.227557*** (0) |
| | FDI | -2.994099 (1) | -5.535596*** (0) |
| Jordan | | | |
| (1976-2013) | Y | -1.557473 (2) | -4.275151*** (0) |
| | FDI | -2.022327 (0) | -6.355721*** (0) |

Notes: Y and FDI as defined above. Optimal lags according to Schwarz Information Criterion (SIC) are given in parenthesis.
***, **, and * indicate significance levels of the 1%, 5%, and 10%, respectively.

Table 2 presents the Chi-square statistics and the p-values for the purpose of testing the Granger-no causality using Toda-Yamamoto method in the case of each country. The results show that the null hypothesis of Granger-no-causality from foreign direct investment to economic growth can be rejected in the case of Egypt and Jordan lending support to a unidirectional Granger causality from FDI to economic growth (or FDI-led Growth hypothesis). However, the null hypothesis of Granger-no-causality from economic growth to FDI cannot be rejected.

**Table 2**
**Granger Causality Test Results Based on Toda-Yamamoto Method**

| Ho: | Lag Length/Var order | MWald Statistics(d.o.f.) | p-value |
|---|---|---|---|
| Egypt: | | | |
| FDI ≠> Y | 1/2 | 12.38147 (1) | 0.0004*** |
| Y ≠> FDI | 1/2 | 0.319791 (1) | 0.5717 |
| Jordan: | | | |
| FDI ≠> Y | 1/2 | 5.732764 (1) | 0.0167** |
| Y ≠> FDI | 1/2 | 0.018575 (1) | 0.8916 |

Notes: Y and FDI as defined above. Optimal lags are determined according to Schwarz Information Criterion (SIC). Degrees of freedom (d.o.f.) are given in parentheses.
***, **, and * indicate rejection of the null hypothesis at significance levels of the 1%, 5%, and 10%, respectively.

## 4. CONCLUSION

Using time series data, this study empirically examines the causal relationship between foreign direct investment (FDI) and economic growth in two MENA countries, namely Egypt and Jordan using the Granger-no-causality method developed by Toda and Yamamoto (1995). The empirical results give support to FDI-led growth hypothesis. In the case of Egypt and Jordan, the results show a unidirectional causal relation between FDI and economic growth and it runs from FDI to economic growth lending support to the FDI-led Growth hypothesis. Therefore policies should consider providing incentives and measures that attract foreign investment into their countries such as financial incentives and lower taxes or tax breaks, institutional and legal reforms, continuing the reforms in its educational and labor sectors, and developing its infrastructures. In addition, countries should adopt policies that promote growth such as human capital development and export promotions. The results should, however, be interpreted with cautious due to omission of some variables. It should also be noted that the results may be sensitive to sample size and the choice of the measures that are used for variables used in the study.

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