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The Validity of Export-Led Growth Hypothesis for Jordan: A Bounds Testing Approach

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ABSTRACT: The Export-led growth hypotheses postulates that there is a positive causal relationship running from exports to economic growth**.** Accordingly, the aim of this study is to empirically investigate the applicability of the Export-Led Growth hypothesis for Jordan over the period 1980-2012. The Autoregressive Distributed Lag model (ARDL) to cointegration approach was used to ensure the existence of the long-run linear combination among variables over the study period as well as the short run movement. The tests of the variables properties show that the included variables are integrated of order one, I(1), and cointegrated indicating the existence of a long-run equilibrium. The empirical results show that they are in line with previous research specifically on Jordan case. Namely, that the exports are a significant stimulus of the economic growth in Jordan, where exports affect output growth positively in both the short-run and in the long-run. These results suggest that authorities implement an export expansion strategy to stimulating exports and hence economic growth.

Keywords: Exports; Economic Growth; ARDL; Jordan.
JEL Classifications: C22; F14; F43.

1. Introduction

Jordan implemented the import-substitution policy during the seventies hoping to reduce imports and improve trade balance, but did not succeed (Al-Tarawneh, 2008). Also, Import-substitution strategy pursued by many developing countries as a strategy for growth and development was not successful in promoting economic growth in East Asian Tigers and the Latin-American countries over the past three decades (Santos, 2012). This situation gave the incentive to implement the export-led growth as a strategy for promoting economic growth in most developing countries. The Export-Led Growth strategy aims at increasing the productive capacity international market due to the economic openness in the 1970s which encouraged countries to pursue such strategy.

The main idea of export-led growth hypothesis (ELGH) postulates that exports are the main determinants of economic growth expansion, and hence it is considered as a vital source of economic growth. In support of the hypothesis, it is argued that export affects economic growth via total factor productivity channel through dynamic spillover effects (Feder, 1983).

In theory, there are several ways in which exports can potentially increase total factor productivity (TFP) growth. Salvatore and Hatcher (1991) justified role of exports in economic growth. The first justification is that the neutrality of incentives associated with Exports orientation is likely to lead to high factor productivity because of lower capital output ratio. An expansion in exports may promote specialization in the production of export products, which in turn may boost productivity levels and may cause the general level of skills to rise in the export sector. This then leads to a reallocation of resources from the (relatively) inefficient non-trade sector to the higher productive export sector. This productivity change leads to output growth (Kimberly et al., 2011). Balassa (1985) asserts that in general, the production of export goods is focused on those economic sectors of the economy which are already more efficient. Therefore, export expansion helps to concentrate investment in these sectors, which in turn increases the overall total productivity of the economy.

The second one is that exports alleviate serious foreign exchange rate constraints, and can thereby provide greater access to international markets. The third one is that exports are likely to result in high rate of technology innovation and dynamic technology transfer from abroad. The final justification is that exports contribute to creating job opportunity and increasing labor productivity. These arguments have been reinforced by the endogenous growth literature stating that exports are expected to increase long-run growth through a higher rate of technological innovation and dynamic learning from abroad (Lucas, 1988; Romer, 1986, 1989; Grossman and Helpman, 1991; Edwards, 1992).

The motivation behind the present study lies in the fact that Jordan concentrated on encouraging export policy in order to enhance economic growth. However, export increase would increase the demand for imports in particular raw and intermediate goods. For that, the study's hypothesis is does export promotion policy increase economic growth?

This study aims at investigating the existence of a positive impact of exports on economic growth in Jordan by estimating the short-run and the long-run relationship between economic growth and exports for the period of 1980 to 2012. For that purpose, the Autoregressive Distributed Lag (ARDL) approach to cointegration is employed. The results of this paper will help to evaluate the effectiveness of Jordan's strategy of growth led by exports.

This paper is organized in the following order: section 1 is an introduction and it gives an overview of the export and economic growth in Jordan during the study period. Section 2 presents the literature review. Section 3 demonstrates the methodology and econometric model. Section 4 presents the estimation results of the co integration analysis of the ARDL and the error-correction model. Finally, Section 5 presents the conclusion and some policy implementations for policy-makers.

2. Literature Review

A significant amount of research has been conducted in the developed countries and emerging economies to prove and establish the ELG hypothesis. Kalaitzi (2013) examined the relationship between primary exports, manufactured exports and economic growth in the United Arab Emirates for the period of 1980-2010 by applying the two-step Engle-Granger co integration test, the Johansen cointegration technique and Vector Auto regression model. The empirical findings showed the existence of a long-run relationship between export categories and economic growth. The Granger causality test shows unidirectional causality running manufactured exports to economic growth.

Shahbaz et al. (2011) examined the exports-led growth hypothesis using quarterly data from 1990 up to 2008 for Pakistan by applying the ARDL bounds testing approach, and Error Correction Method (ECM). The empirical findings show that exports are positively correlated with economic growth. This confirms the validity of exports-led growth hypothesis in the case of Pakistan both for short and long span of time. Exchange rate depreciation declines economic growth while running real capital stock improves it.

Santos (2012) has examined the role of export in the economic growth process in Nigeria using causality tests within an error-correction framework for data over the period 1970 to 2009 using the FMOLS, VECM, and Granger causality to estimate the causal relationship between exports, and economic growth. The Granger causality results show that there is evidence of bi-directional causality between export and economic growth in Nigeria. The result of Fully Modified Ordinary Least Square technique indicates that there is positive relationship between export and GDP and vice versa.

Liang and Zuradi (2012) studied the validity of the ELGH for Malaysia for the period 1970 to 2011 using co integration test and Granger Causality test. The empirical findings revealed that real exports and imports in the long-run have a positive relationship with economic growth, while exchange rate showed negative impact on the economic growth. Granger Causality test proved that there is unidirectional causality, running from all the variables growth, that is significant at 5 per cent level in the short-run, except exchange rate. The estimated error correction term reported that there is evidence that the hypothesis of export-led growth is valid in the long-run. Thus, this provides strong evidence to support the ELGH in the Malaysian economy in both the short-run and long-run.

Qazi (2012) investigated the export-led growth, growth-led export, import-led growth, growth-led import and foreign deficit sustainability hypothesis in the case of China, using annual time series data from 1978-2009. The study employs the Autoregressive Distributed Lag (ARDL) approach to determine the long run relationship, and the direction of long run and short run causal relationship is examined by using modified Granger causality test. The results confirm the bidirectional long run relationship between the economic growth and exports, economic growth and imports, and exports and imports.

Kimberly *et al.* (2011) studied the validity of the Export-led Growth Hypothesis for Mexico for the period of 1960-2003 using an export-augmented neoclassical production function is also tested over the period 1960-2003. Evidence offers support for the hypothesis in the short run. However, contrary to the hypothesis, long-run results suggest an inverse relationship between exports and GDP.

Khaled et al, (2010) investigated the direction of the causality between export and economic growth in both short and long run for Libya over the period 1980-2007. The findings indicate the existence of long run bidirectional causality between exports and economic growth. The study results indicate that the export promotion policy contributes to the economic growth in Libya.

Saima et al. (2008) reinvestigated the export-led growth hypothesis in Pakistan using annual time series data on exports, imports, terms of trade, the labor force participation rate as explanatory variables and gross domestic product (GDP) as the dependent variable for the period 1971-2005. The study uses the more comprehensive and recent bounds test or autoregressive distributed lag model (ARDL). The empirical results indicate that exports, labor force, and imports have a positive effect on growth, while the terms of trade has a negative effect. The proxy (Dummy Variable) for trade liberalization has a positive impact on economic growth. The major finding of this study is that the hypothesis of export-led growth in the Pakistan economy is supported in both the short and long run. Economic growth in Pakistan is accompanied by fluctuations in exports and imports both in the short and long run, but the labor force participation rate has a negative effect only in the short run. The terms of trade has the same effect in the short and long run.

Paresh et al, (2007) examined the export-led growth hypothesis for Fiji over the period of 1960-2001 and for Papua New Guinea (PNG) for the period 1960-1999 by using the Autoregressive distributed lag (ARDL) model. The findings of the study suggest that for Fiji there is evidence of export-led growth in the long-run, while for PNG there is evidence of export-led growth in the short-run

Tuck (2006) empirically examined the validity of the export led growth hypothesis for Hong Kong using the components of total exports namely using Granger's causality approach and the Autoregressive Distributed Lag (ARDL) framework. This incorporates both static and dynamic components in order to examine the causation relation between exports' components and economic growth. The export led growth hypothesis is supported by the finding of bi-directional causation between re-exports and real GDP, and domestic exports and real GDP. No causation relation between export of services and real GDP.

Kemal et al (2002) empirically examined the export-led growth hypothesis for Bangladesh, India, Nepal, Pakistan, and Sri Lanka for the period from1960 to 1998 (1975-1998 in the case of Nepal) using a Vector-Auto Regressive (VAR) model. The granger-causality result supported the hypothesis of export-led growth for all countries, though through different channels for different countries. For instance, the results support the hypothesis of short- run causality from exports to GDP for Bangladesh and Sri Lanka, and reverse short-run causation (from GDP to exports) for India and Nepal. For Pakistan, there seems to be no evidence of short run causality in either direction. Turning to the question of long-run causation between exports and GDP, there is strong support for long-run causality from exports to GDP for Pakistan and India. On the other hand, long-run bi-directional causality is detected for Bangladesh, Nepal, and Sri Lanka.

A considerable empirical work has been done on ELG hypothesis for Jordan case. Al-Tarawneh (2008) using the co integration analysis and VECM approach to estimate the quantitative impact of exports on GDP for Jordan for the period of 1974 to 2004. The empirical findings revealed a significant bidirectional positive relationship between exports and the economic growth in Jordan. Said (1997) investigated the relationship between exports and GDP growth for Jordan from 1970 to 1991 using the ordinary least squares method. The findings showed that exports positively affect economic growth in Jordan. Ahmad and Hassan (1997) estimated the standard Cobb-Douglas production using the OLS method for Jordan based on an annual data for the period 1970 -1993. The empirical findings showed a significant positive impact of exports on GDP in Jordan. Shoter and Al-Raymoni (2000) applied the Johansen co integration approach to the annual data for Jordan from 1970-1997 to estimate the relationship between exports and economic growth in Jordan. The co integration results revealed the existence of a significant positive effect of exports on economic growth. Al-Zu'bi and Al-Tal (2004) using a three-stages least squares method investigated the relationship between exports and economic growth for Jordan over the period 1979-2000. The findings revealed that exports are a major factor affecting economic growth in Jordan. AlKhatib (2006) examined the validity of Export-Led Growth hypothesis for Jordan using monthly data for the period of 1973:03-2003:12 using the cross-correlation function to test for the independence hypothesis of exports and industrial production index. The results provide a strong support for the export-led growth hypothesis for Jordan in the short-run but not in the long-run. Also, the Granger Causality test showed a unidirectional causation running from exports to industrial index. Zakia (2007) investigated the validity of the export-led growth hypothesis (ELG) for Jordan for the period of 1969-2004 using the Vector Autoregression (VAR) approach. The core of the study rested on testing the effect of trade liberalization process which was initiated two decades ago on economic growth in Jordan. The empirical results revealed the existence of long run relationship between export growth and economic growth, and a unidirectional causal relationship in the short and long run running from exports to the growth in GDP. The empirical findings provided a strong support for the export-led growth hypothesis for Jordan. The studies used the Ordinary Least Squares (OLS) and the Johansen co integration approach, Vector Autoregressive Model (VAR), Vector Error Correction Model, and Granger Causality method. Contrary to these studies, the present study uses ARDL model which was used in testing the ELG for a longer time horizon.

3. Empirical Model, Econometric Methodology and Data

Considerable empirical models have been investigated to explain the causal relationship between economic growth and exports. These models include a number of explanatory variables in addition to exports that are believed to influence the economic growth level such as imports, human capital, and physical capital. The present research is in line with researches utilizing the Export-led growth model. The export-led growth hypothesis provides an insightful guide in choosing variables for this study on the determinants of Jordanian economic growth. Basically, the identified simple bivariate model is two hypothesizes that economic output is a function of exports. In the usual notation, the functional relationship can be written as follows:

$$\boldsymbol{GDP = f(EXP)} \qquad (\mathbf{1})$$

Where;

GDP: is the Gross Domestic Product

EXP: is the real exports

Taking the logarithm of the variables, the parameters measure the elasticity of GDP with respect to Exports variable. The error term (e) is normally distributed. The logarithm form can be written as follows:

$$\boldsymbol{lnGDP = a_0 + a_1 lnEXP + e_t} \qquad (\mathbf{2A})$$

It is argued that the inclusion of exports variable will have a positive relationship because the correlation between the level of exports and economic growth inevitably will be positive because exports are part of GDP. Therefore, following Al-Samadi (2001) who investigated the role of exports in the economic growth in Jordan, by using GDP variable with and without exports as a dependent variable, the modified model with net GDP can be written as follows:

$$\boldsymbol{lnGDPN = a_0 + a_1 lnEXP + e_t} \qquad (\mathbf{2B})$$

Where $GDPN$: is the level of GDP without exports.

Another line of empirical research employed the simple neoclassical production function:

$$Y_t = A_t K^{\alpha} L^{\beta}$$

Y_t denotes the aggregate production of the economy at time t. A_t is the level of total factor productivity. K_t ,L_t are the levels of the capital stock, and the stock of labour, respectively; and α and β are constants between zero and one that measure capital and labour's share of income respectively. This paper goes beyond the traditional neoclassical theory of production by estimating an augmented Cobb-Douglas functional form, which includes exports. The augmented model can be written as follows:

$$\boldsymbol{Y_t = C_t K^{\alpha} L^{\beta} X_t^{\gamma} M_t^{\delta}} \qquad (\mathbf{3})$$

Where α, β, δ and γ are the elasticity's of production with respect to K_t, L_t, M_t and X_t. By Taking the natural logs (Ln) of equation (3) and expressing it econometrically for estimation purposes we obtain:

$$Y_t = a + \alpha LnK_t + \beta LnL_t + \gamma LnX_t + \delta LnM_t + e_t \qquad (4)$$

Where: a is a constant parameter, and all coefficients are constant elasticity's. e_t is an error term, which captures the influence of all other exogenous factors. Some studies have argued that it is necessary to separate the economic influence of exports on output from the influence incorporated into the growth accounting relationship (Heller and Porter, 1978; Islam, 1998; Herzer et al., 2006). We address this issue by using an aggregate output net of exports:

$$LnNY_t = a + \alpha LnK_t + \beta LnL_t + \gamma LnX_t + \delta LnM_t + e_t \qquad (5)$$

Where NY_t represents Y_t net of exports. The signs of the coefficients α, β, γ are expected to be positive, while the sign of δ could be positive or negative.

The inclusion of exports as a third input provides an alternative procedure to capture total factor productivity (TFP) growth. Salvatore and Hatcher (1991) justified inclusion of exports in the production function on four bases. The first justification is that the neutrality of incentives associated with Exports orientation is likely to lead to high factor productivity because of lower capital output ratio. The second one is that exports alleviate serious foreign exchange rate constraints, and can thereby provide greater access to international markets. The third one is that exports are likely to result in high rate of technology innovation and dynamic technology transfer from abroad. The final justification is that exports contribute to creating job opportunity and increasing labor productivity. However, the inclusion of exports as an argument in the production function has been objected based on that there is a positive correlation between GDP and exports. This argument is not valid as it might appear due to the growth of factors of production and technical progress that cause the growth of GDP. Therefore, the level of economic growth depends on the amount of these factors in the production process, and if these variables are low then the economic growth will be low irrespective of the exports level (Kavoussi, 1984).

The inclusion of imports in the model is based on the result of Riezman et. al. (1996), Henriques and Sadorsky (1996) and Al-Yousif (1997). Riezmanet *et. al*. (1996) argued that imports were crucial in testing this hypothesis to avoid producing a spurious causality result.

Bounds test for co integration (ARDL Co integration Approach**):** For the purpose of achieving the study objectives, the study utilizes the co integration and error correction analysis to estimate the short-run and long-run relationship among the model variables, and to demonstrate the adjustment process by using the Autoregressive distributed Lag (ARDL) approach. The (ARDL) co integration procedure introduced by Pesaran and Shin (1999) and Smith (1997, 2001) has been used to examine the long-run relationship between exports (other variables) and growth. The paper follows the methodology developed by Pesaran et al (2001) by using Autoregressive Distributed Lag (ARDL) approach to estimate the long-run and short-run models. The interest of the study is to estimate the co integration relationship between economic growth and exports, and other variables, then the model can be specified as a constrained error-model format. This would help in distinguishing between the long-run from the short-run effects of independent variables on economic growth. A unit root test was done for the dependent variable using the Augmented Dickey-Fuller (1979, 1981) test to satisfy the pre-requisite condition of the dependent variable being non stationary or contains a unit root in I(1) and stationary at I(0) as prescribed by Pesaran (2001). Pesaran et al (2001) reported two sets of critical values; upper bound critical values assuming all variables are I(1), and lower bound assuming all variables are I(0).

This study empirically examines the validity of the ELGH for Jordan using the Autoregressive Distributed Lag (ARDL) approach to co integration proposed by Pesaran (2001). As a necessary pre-condition, the ARDL model requires that the dependent variable be integrated of order one, I(1). For that purpose, the augmented Dickey-Fuller (ADF) unit roots test which was introduced by Dickey and Fuller (1979, 1981) is used.

To implement the bounds testing procedure, developed by Pesaran et al (2001), it is essential to model the relationship between GDP, exports and imports (equation 5) as a conditional autoregressive distributed lag model (ARDL). This goes as follows:

$$LnY_t = a_0 + \alpha_1 LnY_{t-1} + \alpha_2 LnEX_{t-1} + \alpha_3 LnIMP_{t-1} + \sum_{i=1}^{p} \delta_i \Delta LnY_{t-i} + \sum_{i=0}^{q} \beta_j \Delta LnEX_{t-j} + \sum_{i=0}^{s} \theta_j \Delta LnIMP_{t-j} + e_t \qquad (6)$$

Here, LnY is the natural log of the real gross domestic product. LnEX is the natural log of the real exports. LnIMP is the natural log of the real imports. An autoregressive distributed lag (ARDL) model, more explicitly bounds test approach as introduced by Pesaran et al (2001), is used to test and examine the evidence for a long run relationship and this can be conducted using the F-test. The ARDL approach involves two steps for estimating the long-run relationship (Pesaran et al., 2001). The first step is to examine the existence of a long–run relationship among all variables in the equations being estimated. The second step is to estimate the long and short-run coefficients of the same equation.

We run the second step only if we find a long-run relationship in the first step. For the examination of long- run relationship, the bound co integration test based on critical values, which are taken from Pesaran (2001), will be used with the null H_0 (no long-run relationship) and alternative hypotheses H_1 (a long run relationship). The approximate critical values for the F-test are obtained from Narayan (2005). The asymptotic distribution of critical Export-led hypothesis values is obtained for cases in which all regressors are purely I(1) as well as when the regressors are purely I(0) or mutually co integrated.

ARDL approach to co integration has various econometric merits that made the approach gain great acceptance over the well-known residual-based approach proposed by Engle and Granger (1987), and the maximum likelihood-based approach proposed by Johansen and Juselius (1990). The model allows a sufficient number of lags to capture the data generating process in a general-to-specific modeling framework (Laurenceson and Chai 2003, p. 28). Moreover, a dynamic error correction model (ECM) can be derived from ARDL through a simple linear transformation (Banerjee et al 1993, p. 51). This allows for inferences of long-run estimates and it is not possible under alternative cointegration procedures.

The first advantage is that it does not require all variables to be stationary at the first level of difference, i.e. I(1). Moreover, it is also appropriate if all the variables are integrated in different orders in I(1) form or some in I(0) form or they are mutually integrated (Al-Malki and Al-Assaf 2014). This advantage gives the researcher the ability to skip the pre-unit-testing as a pre-request required by the Johansen co integration approach. The second advantage is that the ARDL test is relatively more efficient regardless of the small sample size and finite sample data sizes. The third advantage is that applying the ARDL approach to co integration provides unbiased estimates of the long-run model (Harris and Sollis, 2003).

The important advantage of ARDL against the Engle and Granger (1987) single equation co integration analysis is that the EG approach suffers from problems of endogamies while the ARDL model is able to distinguish between dependent and explanatory variables. Another important advantage of the ARDL procedure is that estimation is possible even when explanatory variables are endogenous (Alam and Quazi, 2003). Hence, the ARDL model provides robust results for small sample sizes.

It also shows that appropriate lags in the ARDL are corrected for both residual correlation and endogeneity. As long as the ARDL model is free of residual correlation, endogeneity is less of a problem (Pesaran and Shin 1999).

It also shows that appropriate lags in the ARDL are corrected for both residual correlation and endogeniety. As long as the ARDL model is free of residual correlation, endogeneity is less of a problem (Pesaran and Shin 1999). The short and long-run parameters with appropriate asymptotic inferences can be obtained by applying OLS to ARDL with an appropriate lag length.

Wald test coefficient restriction: The F-test tests the joint significance of the coefficients on the one period lagged levels of the variables included in the model. To test for the existence of the long-run relationship among the variables we impose restrictions on the estimated long-run coefficients of the variables. A Wald test coefficient restriction was used to restrict the variables in the model. This came in negative after the calculation of the equation. By doing Wald test estimation, we got results for the

F-statistics that show us the long-run relationship of the variables included in the model. The value of the F-statistics was compared with the upper or lower boundary described by Pesaran et al. (2001). The Wald test (F-statistic) was calculated by imposing restrictions on the estimated long-run coefficients for the examination of the long- run relationship. The calculated F-statistic in this procedure has a nonstandard distribution, and is compared with two sets of critical values tabulated by Pesaran et al. (2001) i.e. to conduct bounds testing for the above equation.

If the F-statistic is greater than the upper bound value, thus we can easily reject null hypothesis (H_o: $a_1 = a_2 = a_3 = 0$) irrespective of whether the variables are I(0) or I(1) and conclude that there is a long run relationship between the dependent variables and the economic growth. If, however, the calculated F-statistics is below lower critical values, then the null hypothesis of no co integration cannot be rejected. On the other hand, if the calculated F-statistics falls inside these two bounds, then the results are inconclusive. When one set assumes that all variables are I(0), the decision is based on the lower bound; when the other set assumes they are I(I), then the decision is based on the upper bound. Once co-integration is established, a lag length is selected for each variable. The ARDL method estimates *(p+1) k* number of regressions in order to obtain the optimal lag length for each variable, where *p* is the maximum number of lags used and *k* is the number of variables in the equation. The model can be selected using model selection criteria such the Schwartz Bayesian criteria (SBC) or Akaike's information criteria (AIC). The AIC-based model is selected here because it has a lower prediction error than that of the SBC-based model.

The Error Correction Model (ECM): In the second step, the long-run relationship is estimated using the selected ARDL model. When there is a long-run relationship between variables, then there exists an error correction representation. Therefore, in the third step, the error correction model is estimated. The error correction model result indicates the speed of adjustment back to the long-run equilibrium after a short-run shock.

The relationship between co-integration, error correction, and the ECM was introduced by Engle and Granger (1987). The ECM basically provides information about the causal factors that may affect the variables. An error correction term among co-integrated variables shows the changes in dependent variable with respect to independent variable. This indicates the deviation in dependent variable for a short period of time to the long run equilibrium relationship (Masih and Masih, 1997).

It is possible to calculate the error correction term (ECT) from the long-run equation proposed by Pesaran et al (2001) by replacing the lagged level variables in the ARDL equation with ECT_{it-1} and estimating the model after imposing the same optimal lags. This error correction model can be written as follows:

$$\boldsymbol{LnY_t = a_0 + \sum_{i=1}^{p} \delta_i \Delta LnY_{t-i} + \sum_{i=0}^{q} \beta_j \Delta LnEX_{t-j} + \sum_{i=0}^{s} \theta_j \Delta LnIMP_{t-j} + ECT_{it-1} + e_t} \quad \textbf{(7)}$$

The error correction term (ECT) indicates the direction and the speed of adjustment in the model due to any short-run disequilibrium by examining sign and the statistical significance of the ECT. The ECT basically links the long-run equilibrium implied by the co integration relationship with the short-run adjustment process describing the mechanism by which the variables react following any shock that takes out the long-run equilibrium. The appearance of ECM with a negative sign and significance make sure the long-run relationship can be attained among the variables included in the model. A negative and statistically significant ECT indicates adjustment of the economic growth towards its long-run equilibrium as indicated by export variable that follows any short-run disequilibrium. The higher the absolute value of the ECT is then the faster the coefficient adjustment process is.

The first part of the above equation represents the long-run dynamics of the model while the second part shows the short-run relationship. In which Ä is the first difference operator, u_t is a white noise disturbance term, and all variables are expressed in natural logarithms. The equation indicates that economic growth, in terms of real GDP, tends to be influenced by its past values so that it involves other disturbances or shocks. Therefore, Equation 7 was modified to capture and absorb certain economic shocks.

Stability Test: A structural stability test for parameter constancy is recommended to ascertain the ARDL model. Also a diagnostic test that examines the serial correlation, functional form, normality, and heteroscedasticity associated with the model is recommended. The structural stability test is conducted by employing the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ). These tests are based on recursive residuals and are known as cumulative sum of recursive residuals (CUSUM) and cumulative sum of squares residuals (CUSUMSQ) tests. Figure plots of recursive residuals give a reliable picture for the analysis of parameter variations and for decision making. The CUSUM and CUSUMSQ tests are also used to test a null hypothesis of parameter constancy over the sample. In a figure plot of the CUSUM test, both 5 percent critical lines and the cumulative sum are plotted. If the cumulative sum crosses the 5 percent critical lines then the parameters are not stable. The second test to check parameter constancy is CUSUMSQ test, which is based on the cumulative sum of squared recursive residuals. Squared residuals are plotted against time and critical lines. Just like the CUSUM test, the significance of deviation from the mean value line is checked by parallel critical lines around the mean value. If the line passes outside the critical bounds, this is an indication of the instability of the regression parameters. Examining the prediction error of the model is another way of ascertaining the reliability of the ARDL model. If the error or the difference between the real observation and the forecast is infinitesimal, then the model can be regarded as best fitting.

4. Empirical Results

The main objective of this study is to investigate the validity of the export-led hypothesis for Jordan. The variables utilized in this study are the real GDP, real exports, real imports, terms of trade, and labor force. The dependent and independent variables (except labor force) were deflated by consumer price index (CPI) whereby the year 2006 was treated as the base year (2006=100). Furthermore, all the time series variables were transformed into log form. The data on all the variables were taken from the publications of Jordan Central Bank (JCB). This study uses the annual data from 1980 to 2012.

The first step in the estimation is examining the stationary properties of the included variables by the unit root tests. It is expected that none of the series variables are integrated of order I(2) or higher order of the integration of the series is not greater than I(1), because I(2) in this situation would complicate the estimation procedure (Saima et al, 2008). The Augmented Dickey-Fuller (ADF) as well as the Phillips and Peron (PP) unit root tests result is presented in Table (1). The autoregressive lag number is selected using the Akiak Information Criterion (AIC) in order to ensure that non-correlated OLS residuals are produced.

Table 1. Unit Root Test

PP test statistic (with intercept)		**ADF test statistic** (with intercept)		***Variable***
First Difference	***Level***	***First Difference***	***Level***	
-3.02**	-1.29	-3.15**	-2.08	***Y***
-8.76***	-0.98	-6.76***	-1.01	***EX***
-5.36***	-0.11	-5.37***	-0.14	***IMP***
-4.79***	-092	-4.74***	-0.94	***L***

Note: ***, ** indicates significant at 1% and 5% level, respectively.

It is clearly noticed from the reported unit root tests, using both ADF and PP tests, that all variables are non-stationary and the null hypothesis of the presence of a unit root cannot be rejected at 5% significance level for any of the variables under consideration. Thus, we can conclude that all variables under investigation are integrated of the same order I (1) and we can then proceed to the next step of our analysis by implementing the ARDL approach to co integration.

The next step of the procedure is to estimate the coefficients of the long-run relationships and associated error correction model (ECM) using the ARDL model. The order of distributed lag on the dependent variables were selected by the Akaike information Criterion (AIC) and turned out to be two since we are using annual data. The Akaike information Criterion selects an ARDL (1, 2, 0) for the variables included in the model. In order to examine the long run co integration relationships among growth rate and exports along with other variables, the bounds tests using the calculated F-statistics from the joint significance of lagged levels of variables is employed to confirm the presence of co integration. The result of the Wald test (F-Statistic) is presented in Table (2).

Table 2. F-statistic of Co integration Relationship

Bound Critical values* (restricted intercept and no trend)		**Significance level**	**Value**	**Test statistic**
I(1)	I(0)		**6.42**	*F*-statistic
5.61	4.29	1%		
4.35	3.23	5%		
3.77	2.72	10%		

Note: * The critical values are obtained from Pesaran et al. (2001), table CI(iii) P.300, unrestricted intercept and no trend with three regressors.

From the previous table, the computed F-statistic 6.42 which is above the upper critical bound 5.61 at 1% significance level shows that the null hypothesis of no co integration is rejected. This indicates that at least one co integration relationship exists among economic growth, exports and imports in Jordan. In order to obtain further evidence of the existence of the long run relationship among economic growth and exports, the ARDL approach estimates the long-run coefficients along with the short run dynamics and then the ECM is estimated to confirm the presence of the relationship.

Table 3 presents the long-run estimated coefficients based on the Akaike information criterion (AIC). The selected ARDL (1,2,0) passes the standard diagnostic tests (serial correlation, functional form, normality and heteroscedasticty) which are shown at the lower panel of the table. Firstly, it is observed that imports have contributed positively to output growth in the long-run. The results also indicate that exports in the previous periods play a significant role in enhancing the economic growth in Jordan, where the estimated coefficient of LEX_{t-2} shows that exports have a positive and significant impact of economic growth in the long-run. This finding confirms the previous results obtained from F-statistic of Bounds test, which indicates that at least one co integration relationship exists among variables under investigation.

Table 3. Long Run Coefficients using the ARDL Approach[1]

ARDL(1,2,0) selected based on AIC			
Dependent variable is **LY**			
31 observations used for estimation from 1982 to 2012			
Variable	Coefficient	Standard Error	T-Ratio[Prob]
LY_{t-1}	0.821	0.061	13.71 [0.000]
LEX	-0.052	0.067	-0.778 [0.444]
LEX_{t-1}	-0.144	0.082	-1.76 [0.090]
LEX_{t-2}	0.179	0.064	2.798 [0.010]
$LIMP_t$	0.22	0.056	3.94 [0.001]
C	1.85	0.945	1.967[0.060]
R-Squared 0.986		R-Bar-Squared 0.987	
S.E. of Regression 0.048		F-stat. F(5, 25) 457.76 [.000]	
Mean of Dependent Variable 22.6			
Residual Sum of Squares 0.059			
Akaike Info. Criterion 47.02		Schwarz Bayesian Criterion 42.71	
DW-statistic 1.64		Durbin's h-statistic 1.05 [.293]	

[1] The selected estimated model is based on the General-Specific technique, where the insignificant variables are ignored in this model, without losing any significant information.

Diagnostic Tests		
Test Statistics	LM Version	F Version
* A:Serial Correlation	*CHSQ(1)= 0.983 [0.321]	*F(1, 24)= .786 [0.384]*
* B:Functional Form	*CHSQ(1)= 1.60 [0.206]	*F(1, 24)= 1.30 [0.264]*
* C:Normality	*CHSQ(2)= 0 .58108[0.748]*	-
* D:Heteroscedasticity	*CHSQ(1)= 0.0069 [0.934]	*F(1, 29)= .0065 [0.936]*
A:Lagrange multiplier test of residual serial correlation		
B:Ramsey's RESET test using the square of the fitted values		
C:Based on a test of skewness and kurtosis of residuals		
D:Based on the regression of squared residuals on squared fitted values		

The short run dynamics along with the error correction term results are presented in Table 4. It is also found that exports in the previous period have a positive and a statistically significant impact on economic growth. The growth rate in export flows affect the economic growth rate; whereas if a 1% of the export growth rate increases in the previous year then it will usually increase the economic growth rate by about 0.17%. This effect is relatively small comparing with the effect played by imports in the short run. The error correction term (ECT) reflects the speed of adjustment to equilibrium in the long run. This term indicates how quickly variables return to equilibrium, therefore, it reflects the long-run relationship among variables. The empirical results in Table 4 show that the estimated coefficient of the ECT is 0.177 and has the expected negative sign and is highly significant (at a 1% level of significance). Although this coefficient indicates law rate of convergence to equilibrium, it supports the finding of the presence of long-run relationship between economic growth and exports along with other variables.

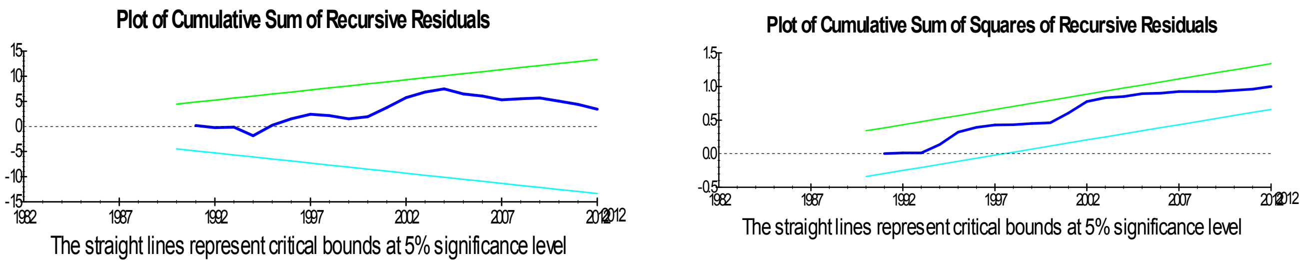
Table 4. Error Correction Estimates and Short-run Dynamics

ARDL(1,2,0) selected based on AIC			
Dependent variable is ΔLY			
31 observations covering the period 1982- 2012			
Variable	Coefficient	Standard Error	T-Ratio[Prob]
ΔLEX	-0.052	0.067	-0.778[0.444]
ΔLEX_{t-1}	0.179	0.064	2.79 [0.010]
$\Delta LIMP$	0.219	0.056	3.94 [0.001]
C	1.86	0.945	1.97[0.060]
ECT_{t-1}	-0.177	0.06	-2.94 [0.007]
R-Squared 0.55		R-Bar-Squared 0.46001	
S.E. of Regression .049		F-stat. F(4, 26) 7.64[0.000]	
Mean of Dependent Variable 0.044		S.D. of Dependent Variable 0.066	
Residual Sum of Squares 0.059		Equation Log-likelihood 53.02	
Akaike Info. Criterion 47.02		Schwarz Bayesian Criterion 42.72	
DW-statistic 1.64			

Finally, we have examined the stability of the long-run parameters together with the short-run dynamics to ensure the robustness of our results using the cumulative sum (CUSUM) and the cumulative sum of square (CUSUMSQ). A graphical representation of CUSUM and CUSUMSQ statistics are provided in Figures 1. If the plot of the CUSUM and CUSUMSQ remains within the 5% critical bound then the null hypothesis is that all coefficients that are stable cannot be rejected. The plots indicate that none of the straight lines (drawn at the 5% level) are crossed by CUSUM and

CUSUMSQ. i.e. the plots of both the CUSUM and CUSUMSQ are within the boundaries and therefore these statistics confirm the stability of the long-run coefficients of the estimated equation.

Figure 1. Plots of CUSUM and CUSUMSQ statistics for stability test



5. Conclusion

In this paper, we investigated the long-run relationship between export flows and economic growth empirically. In particular, we have confirmed the fact that exports play a significant role in enhancing the economic growth in Jordan. The aim of this study is to empirically investigate the applicability of the Export-Led Growth hypothesis for Jordan over the period 1980-2012. The Autoregressive Distributed Lag model (ARDL) to co integration approach was used to ensure the existence of the long-run linear combination among variables over the study period as well as the short run dynamics.

The empirical results indicate that there is a stable long-run equilibrium relationship among exports, imports, and output growth. From the Bounds test results, it is clearly noticed that there is a strong co integration relationship among variables. The findings of the study show that the speed of adjustment in the ECM is significant and relatively slow. This indicates that although there is a positive relationship between exports and economic growth, it takes about 5 years for the disequilibrium to adjust for the case of Jordan. In the light of our findings, it is strongly suggested that authorities implement an export expansion strategy to stimulating exports and hence economic growth.

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