

Immigration and Economic Growth in Jordan: FMOLS Approach

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Abstract: *This study examines the impact of Guest Workers on economic growth in Jordan for the period 1980-2012 using the Fully Modified Ordinary Least Square (FMOLS) approach. The economic model incorporates the Cobb-Douglas Production function where the real GDP represents the dependent variable whereas capital (K), domestic labor (LD), and Guest Workers (LG) are the independent variables. The results of the unit root and the co-integration tests revealed that all variables are integrated of order one, I (1) and cointegrated indicating the existence of a long-run equilibrium relationship among variables included in the model and hence, the FMOLS can be used to estimate the economic model.*

The empirical findings showed that real capital and Domestic labor variables have positive and significant impacts on economic growth, while Guest workers variable has positive but insignificant impact on economic growth. The result can be explained by the fact that Guest workers are characterised as unskilled labor working mostly in the agriculture sector.

Keywords: *Jordan, immigration, FMOLS, Cointegration, Economic Growth*

1. INTRODUCTION

There has been a debate related to immigration issue centred on the perception whether or not immigration is useful to the host country's economic performance, and the debate concerned with the labor market effects of immigration -unemployment and wages- (Gianluca, 2010). A new stream of research focused on the effects of immigration economic performance in the host countries in terms of the macro level as well as micro level (Ortega & Peri, 2009; Younsho *et al.*, 2012; Gianluca, 2010; Moody, 2006; Morely, 2006). It is believed that immigration can have either a positive or a negative effect on labor market employment and economic growth (Li, 1972; Loannis & Panos, 2008; Boubtane & Dument, 2011; Borjas, 1995).

The empirical research methodology of this issue utilized different economic models that produced mixed results. These results suggested that the quantity and the quality of human capital embodied in immigrants play an important role. Moreover, positive impact reflects a high level of human capital while the negative impact reflects a low level of human capital (Drinkwater *et al.*, 2002; Morely, 2006). Furthermore, the direction of the causation between immigration and economic growth supports the hypothesis of the unidirectional effect running from economic growth to immigration (Morely, 2006; House 2008; Younsho *et al.*, 2010). Morely (2006) provided that this result is due to the increased demand for labor in the host country leading to an increase in the wage level and living standards, and hence, attracting immigrants to the host country. Another stream of research found a negative impact on economic growth.

Since the late seventies of the 20th century Jordan implemented the open door policy to bridge the gap in labor market due to the migration of domestic labor to Gulf countries. Immigrant labor in Jordan is described as complementary rather than substitute for domestic labor. During the last decades, international labor migration to Jordan has increased significantly. The number of immigrants arrived to Jordan substantially increased from about 165 thousand in the 1990 to 298.34 thousand in the 2010 (Department of statistics, 2010). In the past few years, as a result of applying the immigration policy, the number of immigrants in Jordan has declined from 335.707

thousand in 2009 to 298.342 thousand in 2010 to 280.263 thousand in 2011, and the growth rates of immigrant workers also declined to suit the Ministry's strategy in reducing immigrant workers (Ministry of Labor, 2011).

Recently, as the unemployment rate reached as high as 12.5%, the concern about the effects of immigration on labor market, and the increasing share of immigrants in the labour force raised concerns about the impact of international immigration on Jordan economy. One aspect of concern is the effect of immigration on the economic performance in Jordan; that is whether or not immigration contributes to economic growth in Jordan.

The present paper is motivated by the idea to what extent the immigration in Jordan contributes to economic growth in Jordan for the period 1980 to 2012. The research hypothesis suggests that there is a positive impact of immigrants on economic growth in Jordan.

The remainder of the paper is organized as follows. The next section reviews the existing empirical evidence on the interaction between immigration and economic growth. It is followed by the data description of the economic model and the econometric methodology in section 3. Section 4 reports the empirical results. Finally, Section 5 concludes the research and offers some policy recommendations.

2. EMPIRICAL EVIDENCE

The concern of the host countries is the issue of the adverse impacts of expatriates on economic growth. The empirical evidence suggested that immigration has positive and adverse impact on economic growth in the host countries, and in fact the positive evidence has much support than the negative one. The human capital embodied in immigrants played a vital factor in the positive impact. Drinkwater *et al.* (2002) suggested that it is necessary to take into account the human capital of immigrants, and he concluded that the positive contribution of immigrants to economic growth can be true only if the inflow of immigrant workers consist mainly of highly skilled people. Borjas (1995) supported the positive impact of immigrants in the USA case, and his findings revealed that the increase in immigrants led to a 0.1% increase in economic growth rate. According to House (2008), the House of Submission (2006) found no quantitative evidence on impact immigration on GDP per capita. While the 2005 study by National Institute of Economic and Social Research (NIESR) found that immigration contributed about a 3% increase in GDP per capita. In addition the study pointed out that the impact was negative in the short-run and positive in the long-run. The suggested explanation is that in the short-run the negative impact is due to increased unemployment, and slow adjustment in the capital response to immigration. However, in the long-run, the positive effect reflects that immigrants are in the working age and the increase in capital stock (House, 2008).

In the following, a review of some of the recent empirical literature on relationship between immigration and economic growth in the host countries.

Boubtane and Dumont (2013) revealed that immigration in most OECD countries has a positive impact on economic growth in 21 OECD countries for the period of (1986-2006).

Boubtane *et al.* (2012) investigated the causal relationship between immigration and the economic condition represented by GDP and the unemployment rate in 22 OECD countries using panel VAR for the period from 1987 to 2009. The empirical findings reported evidence on the existence of a positive bidirectional causal relationship between immigration and per capita GDP. The authors provided that economic conditions in the destination country motivated the migrants' incentive to migrate.

Youngho *et al.* (2012) examined the impact of immigration on economic growth by estimating the growth equation using both a gravity-style instrument variable approach and the dynamic system - GMM estimator for data spans from 1960 to 2000. The empirical findings showed that immigration from developed economies positively affects the economic growth in the host countries. Furthermore, this positive effect is significantly larger only when the direction of the immigration flows are from developed to developing economies. This result could be attributed to that fact that immigrants from developed countries brought with them – upon entry – advanced knowledge on technology and institutions into the developing host country.

Boubtane and Dumont (2011) examined the causality between immigration and the state of economy (Unemployment and economic growth) in 22 OECD countries using annual data spans from 1980 to 2005. The research methodology employed the panel Granger Causality testing approach developed by Konya (2006). The empirical findings related to the economic growth were adverse depending on each individual country. The results showed that only in the cases of France, Iceland, and Norway there a positive unidirectional causation running from economic growth to immigration.

Peri (2010) examined the impact of immigration on the US economy focusing on the economic performance (GDP) employment using a panel of the 50 states plus DC for the period 1960 to 2008 for the long-run estimation and 1994 to 2008 for the short-run estimation by using the Two Stage Least Squares regression approach (2SLS). The empirical findings revealed that the impact of immigration depends on the states of the economic conditions in the US economy expansion or downturns. In the long-run, immigration positively impacts GDP by improving the US productivity by boosting the economic efficiency of production. However, in the short-run the immigration impact on GDP is negative due to slow adjustment to the ways the US economy functions.

Mariya & Tritah, (2009) investigated the effects of immigration on income and productivity in the host countries using a panel estimation for 20 OECD countries over the 1960 to 2005 period. The empirical findings revealed that immigrants have a positive impact on income and labour productivity in host countries.

Loannis & Panos (2008) reviewed the existing empirical evidence on the relationship between economic growth and immigration both on macro level and on the sectoral level in Greece. One of the empirical evidence on Greece mentioned was the study done by Chlelso et al (2005) which reports a positive and a statistically significant impact on the local economy while it has a negative and statistically significant impact on the agricultural sector.

Joan (2007) examined the effect of immigration on the GDP per capita growth in 24 OECD countries for the period of 1960 to 2005. The empirical findings suggested a negative effect of immigration on GDP per capita growth, driven by the lower productivity of immigrants that is only partially offset by a positive effect on participation. Evidence also reveals positive outcomes for employment rates.

Morley B. (2006) investigated the causality relationship between per capita GDP and immigration in the long and short-run for Australia, Canada and USA using the Autoregressive Distributed Lag (ARDL) approach to co-integration and error correction models (ECM) over the 1930 to 2002 period. The empirical findings of the Granger approach to causality revealed evidence of a unidirectional causality running from economic growth to immigration.

3. THE ECONOMIC MODEL AND METHODOLOGY

3.1 The Economic Model

This section discusses the construction of the empirical model specification in order to capture the hypothesis suggested in theoretical relationship between economic performance and capital, Domestic workers, and Guest workers. As stated earlier the objective of the present study is to empirically examine the contribution of Guest workers to economic performance in Jordan. Since labor is a factor of production, the Cob-Douglas production function will be utilized to maintain the study objective. The economic theory provides that the simple version of the production function includes physical capital (K) and labor (L) as the independent variables take the following form:

$$Y = f(K, L) \tag{1}$$

However, the labor factor consists of all workers in the country. It is possible to break down the labor factor into two categories; the domestic workers (L_D) and the Guest workers (L_G). And hence, the other form of the production function is:

$$Y = f(K, L_D, L_G) \tag{2}$$

Y Gross Domestic Product in Jordan.

K is the physical capital.

L_D is the domestic workers.

L_G is the foreign employment.

Taking the logarithm of the variables, the variables become in the growth rate form and the parameters are the output elasticity. The logarithm form of the econometric model is as follows:

$$Y = \alpha_0 + \alpha_1 \ln K + \alpha_2 \ln L_D + \alpha_3 \ln L_G + \varepsilon_t \dots \dots \dots (3)$$

It is expected that $\alpha_i > 0$ which indicates that all variables are expected to have positive impact on economic growth. The term is normally a distributed error term.

3.2 Data and Methodology

The applied analysis procedure employed in the study is the Fully Modified Ordinary Least Squares approach using time series data for Jordan from 1980 to 2012. The economic variables included in model are Real Gross Domestic Product (RGDP) which is used as a measure of the economic growth, Gross fixed capital formation (k), number of domestic labor (L_D) and number of Guest labor (L_G). The Data was taken from the publications of the Department of Statistics, the Central Bank of Jordan, and the World Bank statistics.

Econometrics Issues

One important econometric issue is the verification of the existence of the long-run equilibrium relationship among variables. This can be maintained by employing the Johansen co-integration approach (1991) or Engle-Granger procedure (1987). The Johansen approach is based on the use of the Vector Autoregressive models (VAR), whereas the Engle-Granger procedure is based on testing the stationarity of the regression residuals. However, there is a difference between the two approaches; the EG procedure did not allow the testing of the hypothesis on the co-integrating relationships themselves, but Johansen approach tests the hypothesis of the long run equilibrium relationships.

Another important issue is to determine the order of integration of each series I(d) of variables included in in equation 3. This can be done by applying ADF test (unit root test).

Stationarity Test (Unit Root Test)

It is required that the stationarity property of the time series be investigated to ensure the use of OLS or not. This action is due to the fact most of the macroeconomic variables are non-stationary, and hence, the estimation of parameters using OLS obtains a very high R^2 , and the rise of spurious regression problem may be generated by a non-stationary process.

The Augmented Dickey-Fuller (ADF) test is used. The ADF test takes the following form:

$$\Delta Y_t = \alpha_0 + \delta Y_{t-1} + \sum_{j=1}^m \beta_j \Delta Y_{t-j} + \varepsilon_t \dots \dots \dots (4)$$

The test for a unit root is a test of significance of the coefficient of (Y_{t-1}) and one cannot reject the hypothesis of unit root when the ADF test-statistic (t-statistic) is less (in the absolute value) than the Mackinnon critical values,.

Co-integration Test

As the ADF results have shown that the variables are integrated of order one, I(1), it is required to determine existence of at least one linear combination I(0) of these variables that is a stable and non-spurious relationship exist among variables (Miguel, 2000)? The Johansen co-integration method was used to determine the number of co-integrated vectors for any given number of non-stationary variables of the same order. Since the Johansen test is very sensitive to the lag length employed in the VECM, the Akaike Information Criterion (AIC) and Schwartz Bayesian Criterion (SBC) statistics are employed to determine the optimal lag length.

Fully Modified Ordinary Least Squares Method (FMOLS)

Various modern econometric techniques were introduced to investigate the existence of a long-run relationship among variables. The study uses the of FMOLS approach to investigate the

relationship between foreign workers and economic performance in Jordan. The FMOLS method produces reliable estimates for small sample size and provides a check for robustness of the results. The FMOLS method was originally introduced and developed by Philips and Hansen (1990) for estimating a single co-integrating relationship that has a combination of I(1). The FMOLS method has an advantage over the EG techniques in introducing appropriate correction to overcome the inference problem in EG method and hence, the t-test for long-run estimates are valid (Himansu, 2007). The Fully Modified Ordinary Least Squares (FMOLS) method utilizes "Kernel estimators of the Nuisance parameters that affect the asymptotic distribution of the OLS estimator. In order to achieve asymptotic efficiency, this technique modifies least squares to account for serial correlation effects and test for the endogeneity in the regressors that result from the existence of Co-integrating Relationships" (Rukhsana and M. Shahbaz, 2008).

4. EMPIRICAL RESULTS

Unit Root Test:

Table reports the Augmented Dickey and Fuller (ADF) results of the unit root test with constant only. The ADF test shows that all variables are non-stationary at levels, but they are stationary at their first differences at a 5% level of significance, and hence the time series are integrated of order one, I(1). The optimal lag length is determined by the minimum value of the AIC criterion.

Table (1). ADF test results

Variable	Level			First differenced		
	ADF	C.V	Lag	ADF	C.V	Lag
LnY	1.66	-2.962	0	-3.619	-2.962	0
LnL _D	-0.842	-2.960	0	-4.687*	-3.670	0
LnL _G	-0.960	-02.960	0	-5.867*	-3.670	0
LnK	1.311	-2.992	0	-5.048	-3.670	0

(*), (**) are the critical values at 1%, and 10% respectively

Co-Integration Results

Since the included variables are I(1), then the next step is the verification of the existence of a long run equilibrium relationship between the model variables using Johansen co-integration approach, that is there is at least one linear combination of the variables that is I(0). To determine the lag length to be used in the test, the VAR estimation was utilized for this purpose. Table 2 reports the VAR lag order selection criteria, and it indicates that the optimal lag length, based on the AIC and SC is 2 lags.

Table 2. VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	51.48473	NA	2.49e-08	-3.320338	-3.082444	-3.247612
1	166.9816	181.4950	4.01e-11	-9.784398	-8.357036	-9.348039
2	836.8877	813.4575*	4.78e-31*	-55.84912*	-53.23229*	-55.04913*

Table 3 reports the test results of the lag exclusion test which indicates that the optimal lag be used in the co-integration test length is one or two lags.

Table 3. VAR Lag Exclusion Wald Tests

	LnY	LnK	LnL _D	LnL _G	Joint
Lag 1	34.99020	26.47908	39.08442	21.30658	7.33E+21
	[1.51e-06]	[7.20e-05]	[2.28e-07]	[0.000709]	[
Lag 2	6.046110	5.885227	8.067225	6.690729	5.25E+21
	[0.301758]	[0.317548]	[0.152569]	[0.244676]	[
df	5	5	5	5	25

Table 4 shows the results of Johansen and Juselius co-integration test performed for the long-run relationship among series by using is presented in. The trace statistics shows a co-integration rank of one, while the Max-Eigen statistics shows two co-integrating equations at a 5% significance level.

Table 4. Unrestricted Cointegration Rank Test (Trace)

Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.651138	63.00200	47.85613	0.0010
At most 1 *	0.490297	32.46269	29.79707	0.0241
At most 2	0.358659	12.91878	15.49471	0.1178
At most 3	0.001281	0.037172	3.841466	0.8471
Trace test indicates 2 cointegrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.651138	30.53931	27.58434	0.0203
At most 1	0.490297	19.54391	21.13162	0.0821
At most 2	0.358659	12.88161	14.26460	0.0817
At most 3	0.001281	0.037172	3.841466	0.8471
**MacKinnon-Haug-Michelis (1999) p-values				

FM-OLS results

The results of ADF and Co-integration tests supported the existence of long-run equilibrium relationships among the model's variables. Hence, the next step is to estimate the long run elasticities using FMOLS method. Table 5 reports the estimating results from FMOLS analysis. The FMOLS results reveal a significant positive effect of fixed capital formation variable (LK) on economic growth, where a 10% increase in real capital causes a 4.8% increase in RGDP.

Table 5. Dependent Variable: LnY

Method: Fully Modified Least Squares (FMOLS)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LnK	0.480173	0.172854	2.777908	0.0100
LnLD	0.396934	0.161288	2.461032	0.0208
LnLG	0.227241	0.167233	1.358830	0.1859
C	4.228135	2.373403	1.781466	0.0865
R-squared	0.815999	Adjusted R-squared		0.794769

Regarding the domestic labor and guest labor variables, the domestic labor variable is positive and significant at 2% while guest workers variable is positive but insignificant. As a result a 10% increase in domestic labor leads to 3.9% increase in RGDP.

5. CONCLUSION

Jordan implemented the open door policy starting at the mid of the end of the seventies due to shortages in the domestic labor market as a result of the increasing construction activities in KSA and the GCC countries. This policy aimed at replacing the outflow of local workers, however, the inflow of expatriates increased substantially. The growth of foreign workers combined with the return of local workers from gulf countries in the nineties due to the Gulf war has risen the concern about the role of guest workers in economic growth especially with rising unemployment rates in Jordan.

The present paper investigated the role of foreign expatriates (Guest Workers) on economic performance represented by Gross Domestic Product (GDP) by utilizing the Fully Modified Ordinary Least Squares method (FMOLS) for the time series data for Jordan over the period (1980-2011). One important limitation of the research is the absence of data on labor market for guest workers on a sectorial level for a long time series.

The tests of time series properties showed that the variables are integrated of order one, I(1) and cointegrated which enables the use of the FMOLS. The FMOLS results revealed a significant positive impact of real capital on economic growth. A 10% increase in capital increases GDP by 4.8% emphasising the role of capital investment in the growth of economic performance in Jordan. Domestic labor variable is significant, and positive showing that a 10% increase in domestic labor increases GDP growth by 3.96%. On the other hand, guest labor variable is

insignificant, and has a negative impact on economic growth. The negative result can be due to the fact that more than 95% of guest labor are working in service sector with low productivity and hence small contribution to the economic growth.

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