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Ismael, Mohanad and Sadeq, Tareq

University of Birzeit

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# Does Phillips Exist in Palestine? An Empirical Evidence

Mohanad Ismael\*and Tareq Sadeq†

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## Abstract

The famous trade-off between inflation rate and unemployment rate is known as the Phillips relation. It is considered as important base for decision makers to stabilize the economy through inflation rate and unemployment rate. Although the Phillips curve is criticized by many researchers, there is a lack of studies that consider emerging-countries economies. The objective of this paper is to find evidence for the relationship between unemployment and inflation in Palestine. According to literature, the relationship is negative in a traditional Phillips curve. We find an inverse relationship between inflation rate and unemployment rate where inflation causes fluctuations in unemployment. In addition, it is shown that inflation rate affects unemployment rate positively only in the short run. This result is unique for Palestinian economy.

**Keywords:** Cointegration; stationary; Phillips curve; Error Correction Model.

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\*University of Birzeit, Economic Department, maburjaile@birzeit.edu.

†University of Birzeit, Mathematics Department, tsadeq@birzeit.edu.

# 1 Introduction

After the Middle East war in 1967, Israel starts to control the external borders of the Occupied Palestinian Territories. A customs union was decreed which implies that Israel can control the international economic relationship between the Palestinian economy and the rest of the world. In addition, the lack of natural resources and oil makes the government depends strictly on foreign aids.

Palestinian economy suffers from high unemployment, high inflation rates, public deficit, high poverty and political instability which makes it difficult for the decision makers and central bank to perform any forecasts for the future. Moreover, the absent of a national currency in Palestine allows agents to use New Israeli Shekel, Jordanian Dinar and U.S. Dollar as official currencies in Palestine.

In 1958, William Phillips discovered a negative stable relationship between inflation rate and unemployment rate using British data from 1861–1957. Two years later, Lipsey (1960) provided the theoretical framework while Samuelson and Solow (1960) suggest a similar negative relation appears for the United States over the same period that Phillips has studied.

Friedman (1968) and Phelps (1967) criticized the hypothesis and pointed out that there is no trade-off relationship between unemployment and inflation. Instead, they argue that a negative relationship between unemployment and inflation can exist in the short-run while it is not surely to get an inverse relation in the long-run.

There are huge numbers of economists who are interested in studying the relationship between inflation rate and unemployment. Lucas (1976) criticizes the existence of Phillips curve by arguing that it might be a negative relation between inflation and unemployment only if workers do not predict that policy makers try to create an artificial situation of high inflation and low unemployment. If, however, workers know that inflation rate will be higher, then they will ask their employers to increase their wages. This situation implies the existence of unemployment together with inflation rate! This criticism is known as “Lucas Critique”.

Further, Alogoskoufis and Smith (1991) supported empirically the “Lucas critique” which denied the existence of trade-off relationship. Niskanen (2002) completely disagrees with the existence of a trade off between inflation and unemployment by publishing a paper entitled “On the death of the Phillips curve” and argues that there is no evidence of the Phillips curve in the United States while the unemployment rate is positively, rather than negatively, correlated with inflation rates in the country.

Recently and after the criticism of Lucas, many economists become interested in conducting research on this topic. King and Watson (1994) provide an empirical support of the existence of a trade off relation between unemployment and inflation in the U.S. economy. DiNardo and Moore (1999) use panel data for 9 member countries of the organization for Economic Cooperation and Development (OECD) using Ordinary Least Square (OLS) and Generalized Least

Square (GLS) methods and obtain a Phillips relation. Gali et al. (2001, 2005) fail to find a strong relationship between inflation and unemployment using GMM approach.

Granger and Jeon (2011) examine the Phillips curve in U.S. for the period of 1861-2006. They argue that, in the linear model, there is a slight causality between unemployment and inflation. However, Granger and Jeon use a time-varying parameter model and concluded that inflation would cause unemployment in the early period, but not the latter.

Using the cointegration approach for industrialized economies, Reichel (2004) figures out a Phillips relation only for U.S. and for Japan. Using quarterly data, Dua and Gaur (2009) get a forward-looking Phillips relation for Japan, Hong Kong, Singapore, Philippines, Thailand, China and India. Furuoka (2007) examines Phillips relation using the unit root test, the Johansen cointegration test and the Granger causality test. He gets a long-term inverse relationship. Schreiber and Wolters (2007) apply VAR cointegration approach and find a long run relationship for Germany.

Similar to the above research, this paper studies the relation between unemployment rate and inflation rate in Palestinian economy using annual (quarterly) data from 1994 –2010. As previously mentioned, Palestinian economy has some particular characteristics such as the lack of local currency and so lack of monetary policy together with no control on borders. These issues allow us to question deeply about main macroeconomic relations like the famous Phillips curve. Furthermore, this idea has not been carried out in Palestinian economy and therefore it would provide some intuitions for policy makers to control unemployment rate in Palestine where it suffers from extremely high unemployment rate around 22% in 2013.

This paper shows that inflation rate and unemployment rate are stationary at levels using Augmented Dickey Fuller (ADF) test.

Using Granger causality test, this paper shows that unemployment difference does not have any impact of inflation difference but inflation difference has a positive influence on unemployment rate. While based on ARDL method, unemployment rate is positively affected by one-period lag inflation rate and negatively by six-periods lag inflation rate.

This result can be explained as follows: Paris agreement makes Palestinian economy heavily restricted to Israeli economy in all issues included international trade, fiscal policy and prices. Furthermore, all commodities passing to the Palestinian territories have to pass through Israel. In addition, Paris agreement makes the Palestinian Territories to be the most important market to Israeli exports in both goods and services. Therefore, of prices increase in Israel, this will automatically affect the Palestinian economy and as a result would affect demand and unemployment. While ...

In the same direction, if prices increase in Israel for any reason, then automatically prices get higher in Palestine. Therefore, contrary to the economic theory where inflation occurs due to either cost-push inflation or demand-pull inflation, the case of Palestinian economy is neither. The inflation in Palestine

is an imported inflation mainly from Israel. Once inflation gets higher, then total demand for goods and services either locally or externally reduces which reduces production as well and so far unemployment arises.

The outline of this paper is the following: Section 2 presents the data and the methodology. Section 3 discusses the results. and finally Section 4. Section 5 is the appendix.

## 2 Theoretical Framework

Assume that the economy consists of labor input only. Hence, in a competitive environment firms set prices based on average wages in the economy only.

$$P_t = w_t \quad (1)$$

While in the non-competitive framework, prices are setting according to both wages and mark-up  $\mu$ . In particular,

$$P_t = (1 + \mu) w_t \quad (2)$$

Further, real wages are depending negatively on unemployment rate and positively on expected prices and on other variables such as unemployment benefits and unemployment insurance  $z$ .

$$w_t = P_t^e F\left(\bar{u}_t, z_t^+\right) \quad (3)$$

The above equation provides the following equality

$$P_t = P_t^e (1 + \mu) F\left(\bar{u}_t, z_t^+\right)$$

Assume that  $F\left(\bar{u}_t, z_t^+\right)$  takes the following form  $1 - \alpha u_t + z_t$ . Then, after some mathematical manipulations, we get

$$\pi_t = \pi^e + (\mu + z_t) - \alpha u_t \quad (4)$$

Since expectations about inflation rate might be positive or negative, we presume that  $\pi^e = 0$ . As a result, Phillips relation becomes

$$\pi_t = \mu + z_t - \alpha u_t \quad (5)$$

where  $\alpha > 0$  measures the influence of unemployment rate on inflation rate (Blanchard and Johnson, 2012).

However, the relation (5) can be reversed through two channels. The first is whenever wages are indexed by inflation. If inflation fluctuations are transmitted to wages, wage differentials are transmitted to labour demand and thus to unemployment. The second channel is through the effect of aggregate demand on economic slowdown and thus on unemployment.

### 3 Data and Methodology

This research paper uses quarterly data of inflation and unemployment rates for Palestine (1996Q2 - 2015Q3). Data are provided by Palestine Central Bureau of Statistics (PCBS). We adopt time-series analysis to study the relationship between unemployment rate on inflation rate and to test the direction of causality in a closed form model.

#### 3.1 Unit-root test

In applied economic literature, the aim of applying the unit-root test is to examine whether the data series are stationary or not. In particular, an Augmented Dickey-Fuller (ADF) unit root test is used (Dickey and Fuller, 1979; Dickey and Fuller, 1981) and Phillips-Perron (PP) test. The null hypothesis in ADF test is that the data series is not stationary, or there exists a unit root. While the alternative hypothesis is that the series are stationary.

There are three cases used to show the existence of unit-root test:

1. without intercept and trend

$$\Delta X_t = \delta X_{t-1} + u_t \tag{6}$$

2. with intercept

$$\Delta X_t = \alpha + \delta X_{t-1} + u_t \tag{7}$$

3. with intercept and trend

$$\Delta X_t = \alpha + \beta t + \delta X_{t-1} + u_t \tag{8}$$

Choosing one of the above cases depends on the shape of data series, whether the data follows a trend line or not.

#### 3.2 Causality Test

Once the results of the unit-root test and the cointegration tests appear, then we determine which Granger-causality should applied. For instance, if the variables are stationary, the Granger-causality relationship is arised using the following estimation:

$$Inf_t = \alpha + \sum_{i=1}^m \beta_{1i} Un_{t-i} + \sum_{i=1}^n \beta_{2i} Inf_{t-i} + \varepsilon_i \tag{9}$$

$$Un_t = \alpha + \sum_{i=1}^n \beta_{1i} Un_{t-i} + \sum_{i=1}^m \beta_{2i} Inf_{t-i} + \varepsilon_i \tag{10}$$

### 3.3 ARDL Test

Recently, Autoregressive-Distributed Lag (ARDL) model have been widely used to test the short run as well as the long run relationship between variables. This test was developed by Pesaran and Shin (1995 and 1998), Pesaran et al. (1996) and Pesaran (1997). The advantage of using ARDL approach is that it is applicable regardless of whether the explanatory variables are purely  $I(0)$  or purely  $I(1)$  or alternately cointegrated. Contrary to the other methods used in the literature, this methodology is viable irrespective of the sample size.

Basically, an ARDL regression model can be described as follows:

$$y_t = \beta_0 + \beta_1 y_{t-1} + \dots + \beta_q y_{t-q} + \alpha_1 x_{t-1} + \alpha_2 x_{t-2} + \dots + \alpha_z x_{t-z} + \varepsilon_t \quad (11)$$

where  $\varepsilon_t$  is the random disturbance term. Further, the autoregressive model implies that the dependent variable  $y_t$  is explained by the lagged values of the same variable as well as the consecutive lags of the independent variable  $x$ .

## 4 Results

### 4.1 Unit-root

The main requirement to generate a regression is to have stationary variables. Therefore, we need to test for the unit root of unemployment rate and inflation rate using Augmented Dickey Fuller test with intercept. Table (1) shows that both variables are stationary at levels since the t-statistics values are more than the critical value at 5% confidence.

Table (1) ADF test at levels (at constant).

Variable	t-Statistics	Critical Value at 5%
Un	-3.023056	-2.899619
Inf	-7.412329	-2.900137

### 4.2 Causality

Granger causality result indicates that the original Phillips relation between unemployment and inflation fails to appear. In particular, Table (2) shows that unemployment rate difference does not "Granger cause" inflation rate difference, but the inflation difference causes unemployment difference. This result means that the traditional Phillips curve does not hold for Palestine, but an inverse relationship exists. This result is explained by the fact that inflation in Palestine is mostly influenced by the amount of imports from Israel which consists of 84% of total Palestinian imports. Thus, any change in prices in Israel will affect our price levels and so inflation is considered as an exogenous variable for Palestinian

economy.

Table (2) Causality test

Null Hypothesis	Obs	F-Statistic	Prob.
INF does not Granger Cause UN	72	3.56306	0.0044
UN does not Granger Cause INF		0.34494	0.9101

### 4.3 ARDL method

Table (3) shows results of the ARDL model. The number of lags is chosen based on the minimum AIC. The results show that unemployment rate is affected positively by the one-period lag inflation rate and affected negatively by six-periods lag inflation rate. These results can be justified as if inflation increases then in the very short run demand and production will decrease and as a result unemployment rate increases. However, in the long run, after six periods, the influence of inflation rate on unemployment rate adjusts and reversed to be negatively. *DI* and *DT* are dummy variables to control for the shifts in unemployments due to second intifada in 2000 and due to Israeli restrictions on workers in Israel respectively.

Table (3) ARDL results

Dependent Variable UN

Variable	Coefficient	Prob.
C	12.80626	0.0000
INF(-1)	56.23175	0.0989
INF(-2)	9.367747	0.7856
INF(-3)	27.35441	0.4448
INF(-4)	10.83205	0.7662
INF(-5)	-6.264097	0.8617
INF(-6)	-65.49627	0.0735
DI	11.12155	0.0000
DT	1.646950	0.0362
R-squared	0.756193	
Adjusted R-squared	0.724734	
Akaike info criterion	5.067647	

A Wald test on the coefficients of lagged inflation is done. We test the restriction if the coefficients of  $\pi_{t-1}$  and  $\pi_{t-6}$  sum up to zero. Table (4) shows no evidence to reject this restriction. Thus, there is no effect of inflation on unemployment in the long run.

Table (4) Wald test of linear restrictions

Test statistic	Value	df	Prob.
t-statistic	-0.1696	62	0.8658
F-statistic	0.0288	(1 , 62)	0.8658
Chi-square	0.0288	1	0.8653

## 5 Conclusion

This paper uses time series data from (1996Q2 - 2015Q3) for both unemployment rate and inflation in Palestinian economy and aims to check whether Phillips curve is applicable in Palestinian economy or not. We apply the unit root test for both series and get that both series are stationary at level. Granger causality test is also applied to test for the direction of the relation between inflation and unemployment. It is shown that inflation causes unemployment to fluctuate and unemployment does not cause inflation to change. Contrary to previous works, this paper shows that Phillips relation does not applicable in Palestinian economy. This can be justified by the interrelationship between Palestinian economy and Israeli economy and the fact that around 85% of Palestinian imports are coming from Israel. So, if prices vary in Israel, then automatically Palestinian economy will suffer the same rise. This is why prices in Palestine is considered as exogenous variable.

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