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# Oil Price Shocks and Unemployment Rate: New Evidence from the MENA Region

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## Abstract

We examine the effects of oil price shocks on unemployment rates in the MENA oil-exporting and oil-importing countries over the period 1991-2017. Using the nonlinear autoregressive distributed lag (NARDL) model, the results show that in the short-run, the positive changes of oil prices only exert a positive (increasing) impact on the unemployment rate for oil-exporting countries. However, in the long-run, positive changes in oil prices have a significant increasing effect on the unemployment rate for oil-exporting and oil-importing countries in the MENA region. We also find that the negative changes in oil prices do not show a significant effect on the unemployment rate. Our findings are in line with predictions of the Dutch disease hypothesis.

Keywords: Oil price shocks, Unemployment rate, MENA region, NARDL.

JEL code: Q43, E24.

## **1. Introduction**

Unemployment especially among youth is one of the main drivers of political instability across the world (Farzanegan and Witthuhn, 2017). The country-wide uprisings across the Middle East and North Africa (MENA) region at the beginning of 2011, were mainly rooted in economic hardships, including high unemployment rate especially among university graduates. This study aims to analyze the role of oil price movements on unemployment rates in oil-exporting and oil-importing countries in the MENA region.

Since the early 1980s, economic theories have examined short and long run impacts of oil price movements on unemployment (see, Hamilton, 1983 ; 1988 and Carruth et al. 1998 among others). On the demand-side, a positive shock in oil price often leads to higher inflation rate and obliges the central banks to raise interest rates. As a result, the real costs of production will rise which then leads to a lower supply of goods and services. A reduction in the aggregate supply of output is consistent with a fall in the demand for labor force and, hence, a rise in the unemployment rate (Uri and Boyd, 1996). However, on the supply-side, the story is mixed and multifaceted. On one hand, positive oil price shocks can be known as the main channel of income transfer from oil importing to oil-exporting economies. Thus, oil-exporting countries can be benefited from higher income through higher export earnings, which would lead to more purchasing power, consumer demand, firms' output, and employment in these countries (Nusair, 2016). On the other hand, it argues that in energy-based economies, the resource sector is known as the leading sector and the manufacturing and agriculture sectors are the lagging ones. In these economies, a positive shock in resource prices which is associated with surging resource exports and real exchange rate appreciation, leads to a sectoral reallocation of economic resources (capital and labor) away from the lagging sectors into the extractive sector and the price of non-tradable goods and services – such as construction-- also rise. Therefore, natural resource booms lead to higher costs in the lagging sectors and diminish their competitiveness in international markets. This phenomenon which is usually associated with the resource-dependent economies is known widely as “Dutch disease” and is one of the explanatory channels of the “resource curse” hypothesis (Pegg, 2010). A significant drop in labor demand in lagging sectors (due to the higher production costs) along with the low absorption capacity of the labor force in the leading sector (due to its capital-intensive nature) puts the labor market in a worse situation and thus increases the unemployment rate.

We contribute to the growing body of literature addressing the impacts of oil shocks upon labor markets. This is the first study to investigate the short- and long-run asymmetric effects of oil price shocks on unemployment rates in the case of MENA oil-exporting and oil-importing countries. The majority of previous studies did not account for oil-exporting countries in their analysis and mainly relied upon on the oil-importing ones.<sup>1</sup> To the best of our knowledge, this paper is one of the first studies that uses an asymmetric non-linear ARDL approach to analyze the short- and long-run responses of unemployment rates to positive and negative changes in oil prices. Our findings illustrate that there is a strong positive relationship between positive changes in oil prices and the unemployment rate, especially in oil exporting countries of the MENA region, a result which supports the Dutch disease hypothesis.

The structure of this paper is as follows. Section 2 reviews the related literature. Section 3 describes the data and estimation strategy. In section 4, we present the results and main findings, and in the last section, conclusions and policy implications are presented.

## **2. Oil price shock and labor market dynamics: a review of literature**

Since the seminal work of Hamilton (1983), there is a growing body of empirical studies exploring the symmetric and asymmetric impacts of oil price shocks on (un)employment. However, a review of current literature shows that the oil price-unemployment nexus has been less analyzed in oil-exporting countries in comparison to the increasing consideration that it has received in oil-importing countries. Among the oil-importing economies, a large body of studies have focused on the case of the US. For instance, Uri and Boyd (1996) examine how movements in crude oil price affected the US labor market over the period 1890-1994. They conclude that an increase in the real crude-oil price increases the unemployment rate by approximately 0.0078 percent. Similar results have been documented by Uri (1996) in the case of the US agricultural sector.

Concerning the structural instability in the oil price and macroeconomy relationship, Andreopoulos (2009) focuses on testing the causal relationship between the unemployment rate, real crude-oil price and real interest-rate in the US. To get the results, the paper applies the time-varying Granger causality through the Markov Switching VAR approach. The results confirm that

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<sup>1</sup> See, for example, Löscher and Oberndorfer (2009) for Germany; Cuestas and Gil-Alana (2017) for Central and Eastern Europe, and Karaki (2018b) for the United States.

any positive shock in oil price is granger causal for unemployment rate during the recession periods, but not during periods of economic expansion.

In most recent papers, Kisswani and Kisswani (2019) examine the role of oil price movements on US male and female employment rates by utilizing the nonlinear autoregressive distributed lags (NARDL) approach. Their empirical evidence verifies the long-run asymmetric effects of oil price shocks on total and male employment. Furthermore, the authors find a unidirectional causality running from oil price shocks to total and male unemployment rates. Similarly, Kocaaslan (2019) through use of the GARCH-in-mean VAR model for the period 1974Q2-2017Q4, analyzes the effects of oil price uncertainty on the unemployment rate in the US economy. His findings show that positive (negative) shocks of oil prices increase (decrease) US unemployment rate. Moreover, the results verify the asymmetric reactions of the unemployment rate to positive and negative shocks of oil prices.

By focusing on the US manufactures, Davis and Haltiwanger (2001) investigate the impact of oil price shocks on job creation and destruction. They find that about 20-25 percent of the changes in employment growth are due to negative oil price shocks. However, the impact of negative oil-price shocks on employment growth is not limited to the industrial sector and extends to the service and construction sectors as well (Herrera et al., 2017).

From a regional point of view, some studies examine the impact of oil price changes on unemployment rate at the US state-level (see, Ewing and Yang, 2009 ; Karaki, 2018a). In this line Karaki (2018b) evaluates the asymmetric response of US regional unemployment to positive and negative shocks of oil prices. He finds that in most US states, except for oil-producing ones, an adverse supply shock in oil markets leads to an increase in unemployment rates. While a positive shock in aggregate demand decreases the unemployment rate for both oil-exporting and oil-importing states.

Regarding the role of the oil and gas industry in Alaska's economic evolution, Bocklet and Baek (2017) test the symmetric and asymmetric effects of oil price shocks on the unemployment rate for the period of 1987Q3-2014Q4. The empirical result reveals that in short-run, oil shocks have asymmetric effects on the unemployment rate. Furthermore, Alaska's unemployment rate is more sensitive to positive shocks of oil price than it is to negative shocks. Along this line, Michieka and Gearhart (2015) test the short- and long-run effects of oil price fluctuations on the employment of Kern county as one of the US largest oil-producing regions. To get more detailed results, both

Brent and West Texas intermediate oil prices are included in the models as independent variables. The findings show causality running from both the oil prices to employment rate in the long-run and no causality in the short-run.

Apart from research indicating that oil price shocks have significant effects on the US (un)employment rate, there are several studies which examine such a relation in other oil-importing economies. For instance, Löschel and Oberndorfer (2009) examine how oil price shocks affect the unemployment rate in Germany. Results of the VAR model show that there is a positive link between the oil price movements and the unemployment rate in the German economy.

To incorporate the effects of the oil price change on the unemployment rate, Gil-Alana (2003) utilizes the Australian seasonally adjusted data for the period 1971Q1-1995Q2. The findings show that both of the variables are fractionally cointegrated and that oil price changes play a significant role in determining the unemployment rate in the Australian economy.

Cuestas and Gil-Alana (2017) focus on the importance of the Central and Eastern Europe countries' (CEECs) labor markets and the subsequent effect of high unemployment rate on increasing migration flow to Western Europe countries. To get more insight into unemployment dynamics, they examine the effects of positive and negative shocks of oil prices on the unemployment rates in CEECs utilizing the non-linear ARDL model proposed by Shin et al. (2014). The overall results show that in short-run, oil price changes have no clear effects on unemployment dynamics. While considering the natural rate of unemployment, they find an adverse relationship between the mentioned variables.

Due to the consequences of the great recession during 2008-2014, the UK economy faced a growing rate of job losses and a three percentage point increase in unemployment rate between 2008 and 2009. Therefore, to assess the evolution of the unemployment rate in the UK economy, Cuestas and Ordóñez (2018) analyze the relationship among oil prices and the unemployment rate before and during the great recession period. Estimation of the Bayesian Structural VAR method shows that the relationship is different before and during the recession years. Furthermore, the authors find that during the crisis, positive shocks in oil prices prevent more increases in the unemployment rate. Following that, Monfort et al. (2019) examine such a relation for the case of Spain in times of financial distress. According to the obtained results, the response of the unemployment rate to oil price shocks is different in the pre-crisis years in comparison to the crisis

period. The results also illustrate that during the crisis years, positive shocks in oil prices negatively correlate to the evolution of the employment rate in the Spanish economy.

Despite the growing body of studies concerning the effects of oil price shocks on the unemployment rate in oil-importing economies, little evidence exists on such relation among oil-exporting economies. Fattah (2017) in her study examines the short- and long-run relationship between the unemployment rate and natural resource rents by using pooled mean group (PMG) - ARDL method for the cases of OPEC and OAPEC countries. She finds that in short-run, there is not any significant relationship between oil price and unemployment. While in long-run, a positive shock in natural resource rents put a positive and significant impact on the unemployment rate in both samples. Karlsson et al (2018) apply the wavelet multi-resolution (MRA) method to analyze the causal relationship between real oil price, unemployment rate, and real interest rate in Norway as an oil-exporting country. According to their results, unemployment rates responded negatively (decreasing) to the oil price shocks after two years of the shocks occurrence.

For the case of the MENA region, there are several studies on how oil price shocks influence economic growth (Berument et al. 2010), exchange rate volatility (Abed et al. 2016 and Nouria et al. 2018) stock market returns (Ajmi et al., 2014; Al-Nahleh and Al-Zaubia, 2011; Bouri, 2015; Maghyreh and Awartani, 2016; Salameh et al., 2012), bank profitability and efficiency (Hesse and Poghosyan, 2016; Said, 2015), and agricultural value-added (Apergis et al., 2014). However, to the best of our knowledge, the asymmetric effect of oil price shocks on the unemployment rate is not examined in the MENA region, covering both oil exporting and importing countries. Our analysis aims to fill this gap in the literature.

### **3. Data and methodology**

#### **3.1 Data**

We use annual data of unemployment rate, inflation rate, GDP per capita growth, secondary school enrollment and domestic credit to private sector from 1991 to 2017 for 19 countries of MENA region (Algeria, Bahrain, Iran, Kuwait, Libya, Oman, Qatar, Saudi Arabia, Syria, UAE, Djibouti, Egypt, Israel, Jordan, Lebanon, Morocco, Tunisia, West Bank & Gaza and Yemen). Data is extracted from the World Development Indicators (WDI, 2019). For the crude oil price, the BP (British Petroleum) real oil price is employed. In addition, to analyze the data more accurately, the sample countries divided into 10 oil-exporting and 9 oil-importing countries (see Appendix 1).

Descriptive statistics are reported in Table 1. The mean of the unemployment rate for the sample of oil importing countries (12.38) is greater than the oil exporting countries (7.66). The oil price variable has the greatest standard deviation (33.69).

	Mean	Max.	Min.	Std. Dev.	No. Obs.
<b>A: Oil-exporting countries</b>					
Unemployment	7.66	31.84	0.12	7.16	270
Inflation rate	5.96	49.66	0.06	7.24	270
GDP per capita Growth	0.85	122.97	-62.23	9.54	270
Secondary School	86.34	150.24	41.78	20.44	270
Private Credit	35.49	103.77	3.91	20.73	270
<b>B: Oil-importing countries</b>					
Unemployment	12.38	31.22	4.22	5.15	243
Inflation rate	6.68	99.80	0.20	9.69	243
GDP per capita Growth	1.94	46.76	-18.75	5.48	243
Secondary School	67.76	106.03	9.80	23.86	243
Private Credit	47.83	105.47	3.01	25.53	243
<b>C: MENA countries</b>					
Unemployment	9.90	31.84	0.12	6.71	540
Inflation rate	6.30	99.80	0.06	8.49	540
GDP per capita Growth	1.37	122.97	-62.23	7.90	540
Secondary School	77.54	150.24	9.80	23.98	540
Private Credit	41.34	105.48	3.01	23.92	540
<b>D: Oil Price</b>					
BP	59.55	124.20	19.59	33.69	27

*Note:* the oil price data is real (USD per barrel)

We also evaluate the degree of relationship between the variables using the correlation analysis. Table 2 indicates a positive correlation between inflation and unemployment rate. The secondary school enrollment rate is negatively correlated with unemployment, except in oil importing countries where the correlation is positive. There is a negative correlation between private credit and unemployment rate while secondary school enrollment rate and oil prices are positively correlated. In addition, a positive correlation exists between private credit and oil price in oil exporting countries and MENA region.



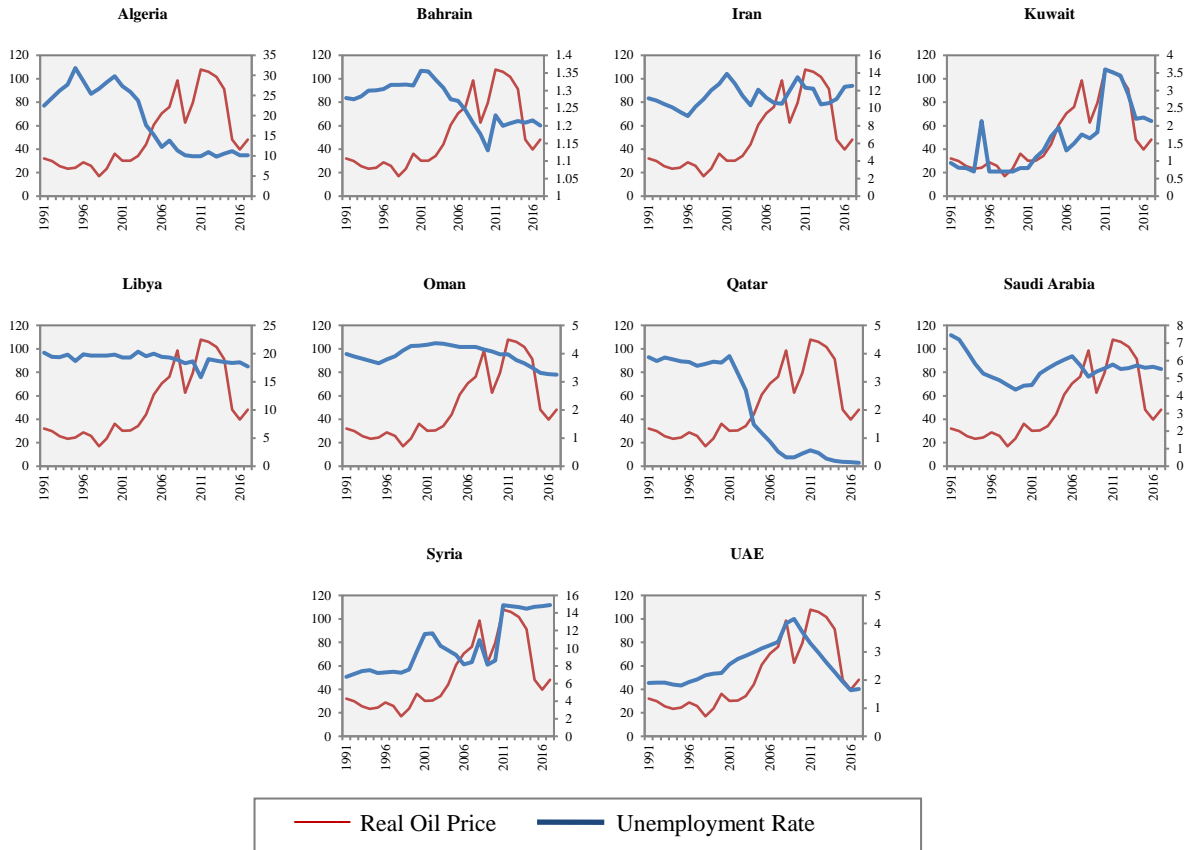
Table 2. Correlation matrix

	(1)	(2)	(3)	(4)	(5)	(6)
A: Oil-exporting countries						
(1) Unemployment	1.000					
(2) Inflation rate	0.348 ***	1.000				
(3) GDP per capita Growth	0.075	0.023	1.000			
(4) Secondary School	-0.230 ***	-0.193 ***	-0.046	1.000		
(5) Private Credit	-0.634 ***	-0.231 ***	-0.143 **	0.593 ***	1.000	
(6) BP Oil Price	-0.049	0.123 **	-0.016	0.334 ***	0.224 ***	1.000
B: Oil-importing countries						
(1) Unemployment	1.000					
(2) Inflation rate	0.113 *	1.000				
(3) GDP per capita Growth	-0.084	0.108 *	1.000			
(4) Secondary School	0.313 ***	-0.067	0.072	1.000		
(5) Private Credit	-0.178 ***	-0.440 ***	0.084	0.382 ***	1.000	
(6) BP Oil Price	-0.069	-0.068	-0.099	0.202 ***	0.082	1.000
C: MENA countries						
(1) Unemployment	1.000					
(2) Inflation rate	0.267 ***	1.000				
(3) GDP per capita Growth	0.076 *	0.053	1.000			
(4) Secondary School	-0.182 ***	-0.122 ***	-0.014	1.000		
(5) Private Credit	-0.305 ***	-0.316 ***	-0.041	0.336 ***	1.000	
(6) BP Oil Price	-0.043	-0.035	-0.043	0.220 ***	0.148 ***	1.000

*Note:* \*\*\*, \*\*, \* indicate statistical significance at 1%, 5% and 10% respectively.

We show the co-movement of the real oil price with the unemployment rate of each country. Each plot of Fig. 1 illustrates the behavior of the unemployment rate for the group of oil exporting countries. It shows that there is a positive relationship between the unemployment rate and the oil price in three countries of Kuwait, Syria and UAE (in line with the resource curse hypothesis). For countries such as Qatar and Algeria, the trends clearly imply that the oil price may not drive unemployment and increasing oil price exerts a negative impact on the unemployment rate, possibly due to other factors besides oil prices.

Figure 1. Unemployment rate of oil-exporting countries and real oil prices (USD)



The graphical plots of Fig. 2 highlight the co-movement of unemployment rate and oil prices for oil-importing countries in the MENA. In some countries such as Djibouti, Israel and Morocco, we see a negative (decreasing) relationship between the unemployment rate and the oil price. However, after taking into consideration all plots in this group, we may not observe a consistent pattern, calling for a multivariate specification which captures both short- and long-run associations better than the bivariate correlation.

Figure 2. Unemployment rate of oil-importing countries and real oil prices (USD)



### 3.2 Methodology

We use a recently developed panel NARDL approach which is the panel data formulation of Shin et al. (2014) NARDL (Nonlinear Autoregressive Distributed lags model) model (Salisu and Isah, 2017) to detect whether an asymmetric relationship exists between the unemployment rate and oil price.

Hence, in this case, asymmetries are estimated by computing the positive and negative partial sum decomposition of the relevant explanatory variable(s). In this setting, the ARDL approach has the advantage in that both long-run and short-run asymmetries between variables can be captured without any prior knowledge about the presence of unit root or mixed order of integration of not more than I(1). Other advantages include the fact that both the dependent and independent variables are allowed for unrestricted number of lags in the model; the ARDL estimators are more efficient in small and finite samples (Pesaran et al., 2001).

Since the panel NARDL model is a nonlinear expansion of the linear ARDL model of Pesaran et al. (2001), it is required to introduce the linear panel ARDL model, as below:

$$\begin{aligned} \Delta u_{it} = & \beta_{0i} + \beta_{1i}u_{i,t-1} + \beta_{2i}p_{t-1} + \beta_{3i}x_{t-1} + \sum_{j=1}^{N1} \lambda_{ij} \Delta u_{i,t-1} + \sum_{j=0}^{N2} \gamma_{ij} \Delta p_{t-j} \\ & + \sum_{j=0}^{N3} \theta_{ij} \Delta x_{t-j} + \mu_i + \varepsilon_{it} \end{aligned} \quad (1)$$

Where  $\Delta$  is the first difference operator;  $u_{it}$  is the log of unemployment rate for each unit  $i$  over the period of time  $t$ ;  $p_t$  denotes the log of oil price benchmark at period  $t$ ;  $x_t$  denotes the other control variables (Inflation, GDP per capita growth, secondary school and private credit) and  $\mu_i$  is the group-specific effect.  $\gamma_{ij}$  measures the short-run relationship between the two variables.

However, we decompose oil price shock into positive and negative shocks as shown in the works of Shin et al. (2014) and Salisu and Isah (2017). In other words, the oil price variable ( $p_{it}$ ) is decomposed into positive and negative changes as follows:

$$u_t = \beta^+ P_t^+ + \beta^- P_t^- + \varepsilon_t \quad (2)$$

Where  $\beta^+$  and  $\beta^-$  are the associated long-run parameters,  $\varepsilon_t$  is an i.i.d. process with zero mean and finite variance and  $p_t$  is decomposed as:

$$P_t = P_0 + P_t^+ + P_t^- \quad (3)$$

Where  $P_0$  is the initial value, and  $P_t^+$  and  $P_t^-$  are the partial sum processes of positive and negative changes in  $P_t$  defined as:

$$p_t^+ = \sum_{k=1}^t \Delta p_{ik}^+ = \sum_{k=1}^t \max(\Delta p_{ik}, 0) \quad (4)$$

$$p_t^- = \sum_{k=1}^t \Delta p_{ik}^- = \sum_{k=1}^t \min(\Delta p_{ik}, 0) \quad (5)$$

Where  $p_t^+$  and  $p_t^-$  denote the positive and negative oil price shocks respectively. If either size or sign of the estimates of  $p_t^+$  and  $p_t^-$  were different, it could be judged as ‘‘asymmetric effects’’. Thus, the asymmetric version of Eq. (1) is obtained as:

$$\begin{aligned} \Delta u_{it} = & \beta_{0i} + \beta_{1i}u_{i,t-1} + \beta_{2i}^+p_{t-1}^+ + \beta_{2i}^-p_{t-1}^- + \beta_{3i}x_{t-1} + \sum_{j=1}^{N1} \lambda_{ij} \Delta u_{i,t-1} \\ & + \sum_{j=0}^{N2} (\gamma_{ij}^+ \Delta p_{t-j}^+ + \gamma_{ij}^- \Delta p_{t-j}^-) + \sum_{j=0}^{N3} \theta_{ij} \Delta x_{t-j} + \mu_i + \varepsilon_{it} \end{aligned} \quad (6)$$

Also, the long-run coefficients for  $p_t^+$  and  $p_t^-$  are measured by  $-\frac{\beta_{2i}^+}{\beta_{1i}}$  and  $-\frac{\beta_{2i}^-}{\beta_{1i}}$ . The error correction version of the above equation is as follows:

$$\begin{aligned} \Delta u_{it} = & \tau_i \xi_{i,t-1} + \sum_{j=1}^{N1} \lambda_{ij} \Delta u_{i,t-1} + \sum_{j=0}^{N2} (\gamma_{ij}^+ \Delta p_{t-j}^+ + \gamma_{ij}^- \Delta p_{t-j}^-) + \sum_{j=0}^{N3} \theta_{ij} \Delta x_{t-j} + \mu_i \\ & + \varepsilon_{it} \end{aligned} \quad (7)$$

Where  $\xi_{i,t-1}$  is the error-correction term,  $\tau_i$  measures the error correction speed of adjustment in the asymmetric panel ARDL.

The prominent techniques used in the estimation of a dynamic heterogeneous panel data model are the pooled mean group (PMG) estimator (Pesaran et al., 1997, 1999) and the mean group (MG) estimator (Pesaran and Smith, 1995). The MG estimator relies on estimating N time-series regressions and averaging the coefficients, whereas the PMG estimator involves the combination of pooling and averaging of coefficients (Blackburne III and Frank, 2007).

Nonetheless, the Hausman test is specified to determine the appropriability between the two estimators. To the best of our knowledge, there is no study that accounts for such nonlinearities in the response of unemployment rate to oil price changes particularly for a panel of oil exporting and oil importing MENA countries.

## 4. Empirical results

### 4.1. Unit Root Test

As a precondition for the choice of an empirical model, we subject all variables to panel unit root tests. We use both the non-stationarity and stationarity tests in three different types. As presented in Table 3, the first type of panel unit root tests with the null hypothesis of common unit root process under Levin et al. (2002) and Breitung (2001) tests. The second category tests the null hypothesis of individual unit root process under Im et al. (2003) and ADF Fisher (1932) tests, while the third unit root type assumes no unit root with Hadri (2000) Lagrange Multiplier test.

The unemployment and oil price indexes of all MENA countries, oil-exporting countries, and oil importing countries are integrated of order one [I(1)] regardless of test type. However, by considering the different unit root tests, the results for other variables are mixed. Thus, these results reaffirm the choice of panel ARDL model as the preferred modeling framework since it is embedded both I(0) and I(1) series.

Table 3. Panel unit root test

	Unemployment	Inflation	GDP per capita	Secondary School	Private Credit	BP oil price
A: Oil-exporting countries						
Levin, Lin & Chu	-8.78 *** <sup>b</sup>	-4.51 *** <sup>a</sup>	-8.76 *** <sup>a</sup>	-7.00 *** <sup>b</sup>	-11.51 *** <sup>b</sup>	-8.92 *** <sup>b</sup>
Breitung	-6.81 *** <sup>b</sup>	-3.76 *** <sup>a</sup>	-4.71 *** <sup>a</sup>	-2.37 *** <sup>a</sup>	-2.08 *** <sup>a</sup>	-6.62 *** <sup>b</sup>
Im, Pesaran & Shin	-1.52 * <sup>a</sup>	-4.41 *** <sup>a</sup>	-8.75 *** <sup>a</sup>	-3.07 *** <sup>a</sup>	-2.64 *** <sup>a</sup>	-7.72 *** <sup>b</sup>
ADF Fisher	34.96 * <sup>a</sup>	52.60 *** <sup>a</sup>	107.17 *** <sup>a</sup>	50.26 *** <sup>a</sup>	40.26 *** <sup>a</sup>	85.87 *** <sup>b</sup>
Hadri Z-stat	0.57 <sup>b</sup>	-0.10 <sup>b</sup>	-0.70 <sup>a</sup>	1.21 <sup>b</sup>	0.26 <sup>b</sup>	-0.27 <sup>b</sup>
B: Oil-importing countries						
Levin, Lin & Chu	-7.06 *** <sup>b</sup>	-3.60 *** <sup>a</sup>	-7.19 *** <sup>a</sup>	-3.67 *** <sup>b</sup>	-1.87 ** <sup>a</sup>	-8.46 *** <sup>b</sup>
Breitung	-7.98 *** <sup>b</sup>	-8.24 *** <sup>b</sup>	-3.61 *** <sup>a</sup>	-2.74 *** <sup>b</sup>	-3.36 *** <sup>b</sup>	-6.28 *** <sup>b</sup>
Im, Pesaran & Shin	-7.40 *** <sup>b</sup>	-4.46 *** <sup>a</sup>	-6.35 *** <sup>a</sup>	-3.92 *** <sup>b</sup>	-4.54 *** <sup>b</sup>	-7.33 *** <sup>b</sup>
ADF Fisher	87.30 *** <sup>b</sup>	60.30 *** <sup>a</sup>	96.19 *** <sup>a</sup>	47.96 *** <sup>b</sup>	53.81 *** <sup>b</sup>	77.28 *** <sup>b</sup>
Hadri Z-stat	0.16 <sup>b</sup>	0.88 <sup>b</sup>	-0.05 <sup>b</sup>	0.78 <sup>b</sup>	1.23 <sup>b</sup>	-0.25 <sup>b</sup>
C: MENA countries						
Levin, Lin & Chu	-10.74 *** <sup>b</sup>	-5.88 *** <sup>a</sup>	-10.11 *** <sup>a</sup>	-10.55 *** <sup>b</sup>	-11.36 ** <sup>a</sup>	-12.30 *** <sup>b</sup>
Breitung	-10.27 *** <sup>b</sup>	-2.78 *** <sup>a</sup>	-3.730 *** <sup>b</sup>	-2.02 ** <sup>a</sup>	-4.49 *** <sup>a</sup>	-9.14 *** <sup>b</sup>
Im, Pesaran & Shin	-11.74 *** <sup>b</sup>	-6.52 *** <sup>a</sup>	-10.28 *** <sup>a</sup>	-1.65 ** <sup>a</sup>	-2.75 *** <sup>a</sup>	-10.65 *** <sup>b</sup>
ADF Fisher	191.68 *** <sup>b</sup>	108.16 *** <sup>a</sup>	192.66 *** <sup>a</sup>	64.86 *** <sup>a</sup>	65.07 *** <sup>a</sup>	163.16 *** <sup>b</sup>
Hadri Z-stat	0.65 <sup>b</sup>	0.63 <sup>b</sup>	-2.28 <sup>b</sup>	-2.82 <sup>b</sup>	0.65 <sup>b</sup>	-0.37 <sup>b</sup>

*Notes:* <sup>a</sup> and <sup>b</sup> denote stationarity at level and at first difference respectively, while \*\*\*, \*\*, \* indicate statistical significance at 1%, 5% and 10% respectively. All the variables here are expressed in natural logs. Null hypothesis for Levin, Lin & Chu test, Breitung test, Im, Pesaran and Shin test, and ADF Fisher is that series has unit root. The null hypothesis for Hadri test is the series has no unit root.

## 4.2. Main Results

We estimate the asymmetric effects of oil price changes on unemployment rate in the oil exporting and oil importing countries of the MENA region. The model is estimated by using panel autoregressive distributed lag (ARDL) to shed light on how oil price shocks affect unemployment rate behavior in both the short- and long-run. Initially, we estimate all of the equations with both the mean group (MG) and pooled mean group (PMG) estimators and then utilized the Hausman

test to establish the most efficient estimator for our data. The results of the Hausman test in Table 4 indicate that the null hypothesis<sup>2</sup> is not rejected. Therefore, the PMG is the appropriate estimator for all models.

Table 4 shows the estimation results based on asymmetric oil price changes. We find that in the long-run, positive changes in oil prices has significant increasing effect on unemployment rate for oil exporting and oil importing countries in the MENA region. The increasing effect is larger both in its economic and statistical significance for case of oil exporting countries. A 1% increase in positive changes of oil prices increases unemployment rate by 0.34% in long run.

This result is consistent with Carruth et al. (1998). In the short-run, the positive changes of oil prices only exert a positive (increasing) impact on unemployment rate for oil exporting countries. The negative changes of oil prices do not show a significant effect on unemployment rate, neither in the long-run nor in the short-run. These findings show more challenges for policy makers to absorb the positive oil shocks, especially in oil exporting countries of the MENA region. While higher oil prices may initially appear to be a blessing especially for oil exporting countries, the final impact on unemployment refers more aptly to the ‘resource curse’ nomenclature. The increasing effect of positive changes in oil prices on unemployment can be explained through the Dutch disease hypothesis (van Wijnbergen, 1984). Higher oil prices and oil revenues for oil exporting countries mean higher public and private spending on both tradable and non-tradable goods in an economy. While the price of tradable goods is given at the international level, the price of non-tradable goods and services is determined in the domestic market. Higher demands for the latter goods increase their prices and as well as the profit margin of the non-tradable sector. The tradable sector, including manufacturing and agriculture, encounter a declining profit margin and thus a higher unemployment rate. In addition, higher oil prices may appreciate the local currency in oil exporting countries. The appreciation of local currency against the US dollar may mean higher prices of domestically produced non-oil goods for international buyers, thus reducing international competitiveness and a loss of market share. As a result, we observe a de-industrialization in affected countries in the long run which in turn means higher unemployment rate (Bjorvatn and Farzanegan, 2013 ; Farzanegan and Markwardt, 2009). The Dutch disease is also shown to be a driver of lower quality of education which can also explain part of the unemployment effects. An expanding non-tradable sector (e.g., public administration and

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<sup>2</sup> Null hypothesis implies that differences in coefficients are not systematic

construction sector) as a symptom of Dutch disease employs less skilled labor and does not require high levels of human capital. This observation sends a distorting signal to the education system and households, reducing their efforts and willingness to invest in higher quality education (Farzanegan and Thum, 2018). Furthermore, in the nonlinear model, the inflation and private credits have a significant negative relationship with unemployment rate.

As expected, the models highlight the common finding of the negative association between inflation and unemployment and likewise the GDP per capita shows robust and statistically significant negative effects on unemployment. Moreover, the lack of any significant effect of secondary schooling on unemployment may refer to mismatches in the education system and or job market. Le et al. (2010) show that the public education spending in oil-rich countries is inefficient.

For financial sector development, the study finds out there is a negative relationship between the unemployment rate and the private credit, thus a lower unemployment rate can be attained by enhancing private investment in the economy through a progressive credit disbursement system.

Variables	Dependent variable: unemployment rate		
	Oil-exporting countries	Oil-importing countries	MENA countries
Oil Price <sup>-</sup>	-0.175 (0.109)	0.021 (0.062)	-0.070 (0.049)
Oil Price <sup>+</sup>	<b>0.345 (0.094) ***</b>	<b>0.075 (0.040) *</b>	<b>0.098 (0.032) ***</b>
Inflation	-0.024 (0.033)	-0.046 (0.040)	0.018 (0.022)
GDP per capita	-0.008 (0.010)	-0.046 (0.008) ***	-0.043 (0.006) ***
Secondary School	-0.510 (0.337)	0.207 (0.168)	0.403 (0.159) **
Private Credit	-0.687 (0.165) ***	-0.288 (0.091) ***	-0.210 (0.058) ***
$\Delta$ Oil Price <sup>-</sup>	0.001 (0.086)	-0.012 (0.038)	-0.019 (0.046)
$\Delta$ Oil Price <sup>+</sup>	0.021 (0.050)	-0.029 (0.050)	0.012 (0.041)
$\Delta$ Inflation	-0.006 (0.011)	0.012 (0.008)	-0.003 (0.006)
$\Delta$ GDP per capita	0.002 (0.002)	0.002 (0.003)	0.003 (0.002)
$\Delta$ Secondary School	-0.156 (0.148)	0.474 (0.276) *	0.130 (0.165)
$\Delta$ Private Credit	0.025 (0.096)	0.108 (0.108)	0.019 (0.072)
Constant	0.690 (0.343) **	0.517 (0.249) **	0.136 (0.081) *
$\xi_{i,t-1}$	-0.132 (0.063) **	-0.185 (0.091) **	-0.131 (0.054) **
Hausman test ( $\chi^2_k$ )	7.61 (0.267)	5.91 (0.433)	2.92 (0.818)
Model	PMG	PMG	PMG
Log likelihood	351.66	371.69	711.70
No. of cross sections	10	9	19
No. of observation	250	225	475

Note: \*\*\*, \*\* and \* denote 1, 5 and 10% levels of significance respectively, while values in ( ) are standard errors.



## 5. Conclusion

Much of the research on the oil–unemployment relationship has concentrated on developed oil importing economies. An empirical study on the impact of asymmetric oil price shocks on unemployment rate in developing countries is still lacking. In this study, we examine the short and long run relationship between positive and negative changes of oil prices and unemployment rates in a sample of MENA countries. Our results from non-linear ARDL (NARDL) models and period of 1991-2017 show a stronger effect of positive changes of oil prices on unemployment in oil exporting countries of the MENA region. In both short and long run, a rising oil prices increases unemployment rate in a sample of oil exporting countries. In long run, a 1% increase in positive changes of oil prices increases unemployment rate in oil exporting countries by 0.34%, controlling for other factors. This is larger than its effects on unemployment rate of oil importing countries (0.07%). The short-term effect of oil price changes on unemployment rate is statistically insignificant.

The negative changes in oil prices show no significant effect on unemployment rate. Our results are in line with theoretical expectations based on the Dutch disease hypothesis, implying higher unemployment rates following positive oil shocks which can lead to smaller size of tradable sector. Industry, manufacturing, and especially agricultural activities become less profitable in oil-based economies compared to not-tradable one. The former sectors employ a significant number of working age population in MENA countries. Our results illustrate the challenging task of effective management of oil windfalls for oil exporting countries and importance of well-functioning institutions such as oil stabilization funds in absorbing price shocks and channelizing oil revenues to productive and job creating projects.

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#### Appendix 1 - Countries grouping

Oil-exporting countries:	Algeria, Bahrain, Iran, Kuwait, Libya, Oman, Qatar, Saudi Arabia, Syria, UAE
Oil-importing countries:	Djibouti, Egypt, Israel, Jordan, Lebanon, Morocco, Tunisia, West Bank & Gaza, Yemen

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Note: all of these countries are included in MENA countries