



### Introduction

The state of Qatar has made the development of a competitive and diversified economy one of its top priorities. The first pillar of its National Vision 2030, the economic development pillar, is intended to optimize the use and the sustainability of Qatar's natural resources (oil and gas revenues).

Recognizing that the reliance on the abundant natural resources left the country vulnerable to the dynamic fluctuations of world energy prices, the Qatari government has massively invested its accumulated oil and gas revenues in the non-oil activities by prioritizing investments in different sectors such as tourism, sport, transport and infrastructure.

A recurrent question that arises is whether these investments have significantly contributed to diversify the economy of Qatar and delink its government revenues from the oil and gas sector.

### Goal and objectives

**Goal:** The aim of this paper is to investigate to what extent oil and gas revenues have contributed to Qatar economic diversification.

**Objectives:** Precisely we will answer the following questions:

- Do oil and gas revenues contribute to *Qatar economic diversification*?
- Does the Qatar economy *resilient* to negative oil prices shocks?
- Does the *Resource curse hypothesis* hold for the economy of Qatar?

### Materials & Methods

#### A. Data sources and variables definitions

**Period:** Quarterly data spanning from 2000Q1 to 2018Q1 ( $T=75$  observations).

**Variables definitions:**

- Real oil and gas revenues (ROGR)** is the total oil and gas revenues (constant US dollar 2004).
- Non-oil real GDP (RNGDP)** is the non-oil real gross domestic product (constant US dollar 2004) is proxy of **Economic diversification**.
- Real exchange rate (RER)** is defined such that an increase means a real depreciation of the Qatari Riyal.
- Inflation rate** is the quarterly changes in the Qatari consumer prices.
- Data source:** All data are collected from the central bank of Qatar and the International Energy Agency.

**Dummy variables:** DU03 (Iraq-US War, 2003:I-2003:IV), DU05 (Liquefied Gas, 2005:II-2006:I), DU08 (Global Financial Crisis, 2007:IV-2010:IV), DU14 (GCC crisis, 2014:II-2014:IV).

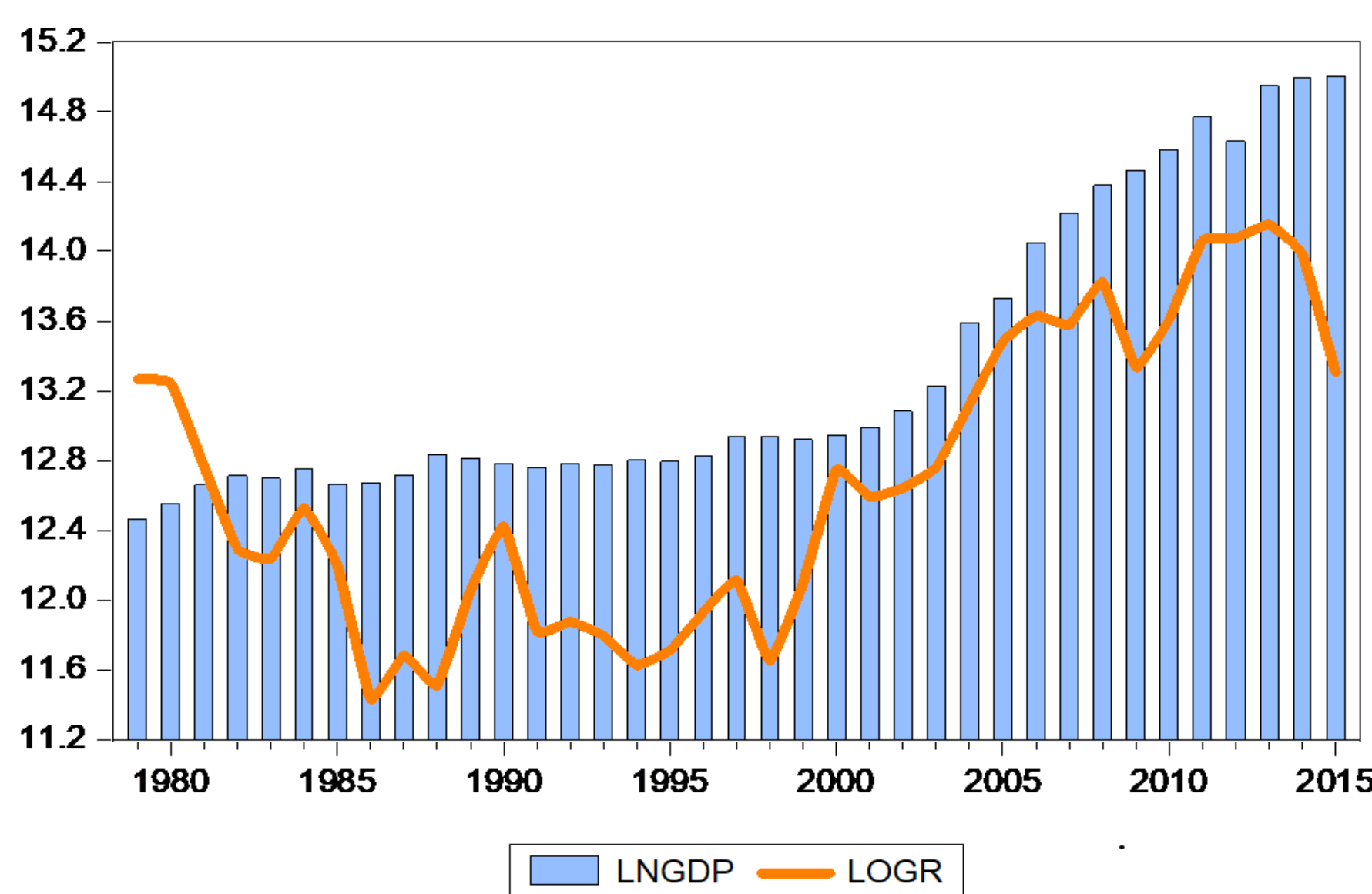


Figure 1: Real oil and gas revenues and real non-oil GDP in Qatar

### B. Econometric Models

Two econometric approaches have been used:

- The A-B structural vector autoregressive (AB - SVARX) model with exogenous variables.
- The nonlinear autoregressive distributed lag (NARDL) model.

#### B.1. The A-B - SVARX model

$$AY_t = A_1 Y_{t-1} + A_2 Y_{t-2} + \dots + A_p Y_{t-p} + C X_t + B u_t \quad (1)$$

Where,  $Y_t$  represents the  $(n \times 1)$  vector of the variables used in the analysis. The vector  $Y_t = [ROGR_t^+, ROGR_t^-, RER_t, INF_t, RNGDP_t]$ .

The relationship between the reduced form innovations ( $\varepsilon_t$ ) and the structural shocks ( $u_t$ ) is given by:  $A \varepsilon_t = B u_t$

The model take the matrix form,

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ X & 1 & 0 & 0 & 0 \\ X & X & 1 & 0 & 0 \\ X & X & X & 1 & 0 \\ X & X & X & X & 1 \end{bmatrix} \begin{bmatrix} \varepsilon_t^{ROGR^+} \\ \varepsilon_t^{ROGR^-} \\ \varepsilon_t^{RER} \\ \varepsilon_t^{INF} \\ \varepsilon_t^{RNGDP} \end{bmatrix} = \begin{bmatrix} X & 0 & 0 & 0 & 0 \\ 0 & X & 0 & 0 & 0 \\ 0 & 0 & X & 0 & 0 \\ 0 & 0 & 0 & X & 0 \\ 0 & 0 & 0 & 0 & X \end{bmatrix} \begin{bmatrix} u_t^{ROGR^+} \\ u_t^{ROGR^-} \\ u_t^{RER} \\ u_t^{INF} \\ u_t^{RNGDP} \end{bmatrix} \quad (2)$$

#### B.2. NARDL model

The asymmetric autoregressive distributed lag (NARDL) model of Shin et al. (2013) applied to the paper context is given by,

$$\Delta LRGDP_t = \rho Z_{t-1} + \sum_{j=1}^{p-1} \gamma_j \Delta LRGDP_{t-j} + \sum_{i=1}^{q-1} (\theta_i^+ \Delta LROGR_{t-i}^+ + \theta_i^- \Delta LROGR_{t-i}^-) + \sum_{i=1}^{q-1} \delta_i \Delta LRER_{t-i} + \sum_{i=1}^{q-1} \pi_i \Delta INF_{t-i} + \varepsilon_t \quad (3)$$

Where,

$$Z_{t-1} = LRGDP_{t-1} - \beta^+ LROGR_{t-1}^+ - \beta^- LROGR_{t-1}^- - \omega LRER_{t-1} - \tau INF_{t-1} \quad (4)$$

$\phi_j$  is the autoregressive parameters of the model.  $\theta_i^+$  and  $\theta_i^-$  are the asymmetric distributed-lag parameters.  $\varepsilon_t$  is the error term which is supposed to be an *i.i.d* process with zero mean and constant variance.

The positive and negative asymmetric adjustment behavior from the initial equilibrium (before the shock) to the new equilibrium (after the shock) are given respectively by,

$$m_h^+ = \sum_{j=0}^h \frac{\partial LRGDP_{t+h}^+}{\partial LROGR_t^+}, \quad m_h^- = \sum_{j=0}^h \frac{\partial LRGDP_{t+h}^-}{\partial LROGR_t^-}, \quad h = 0, 1, 2, \dots$$

### Results

Our main results can be summarized as follows:

#### 1. AB - SVARX results (Short-run)

The responses of non-oil real GDP to negative shocks on real oil and gas revenues are very limited and die completely after one quarter.

- Resilience of the Qatar economy to negative oil and Gas revenues shock.

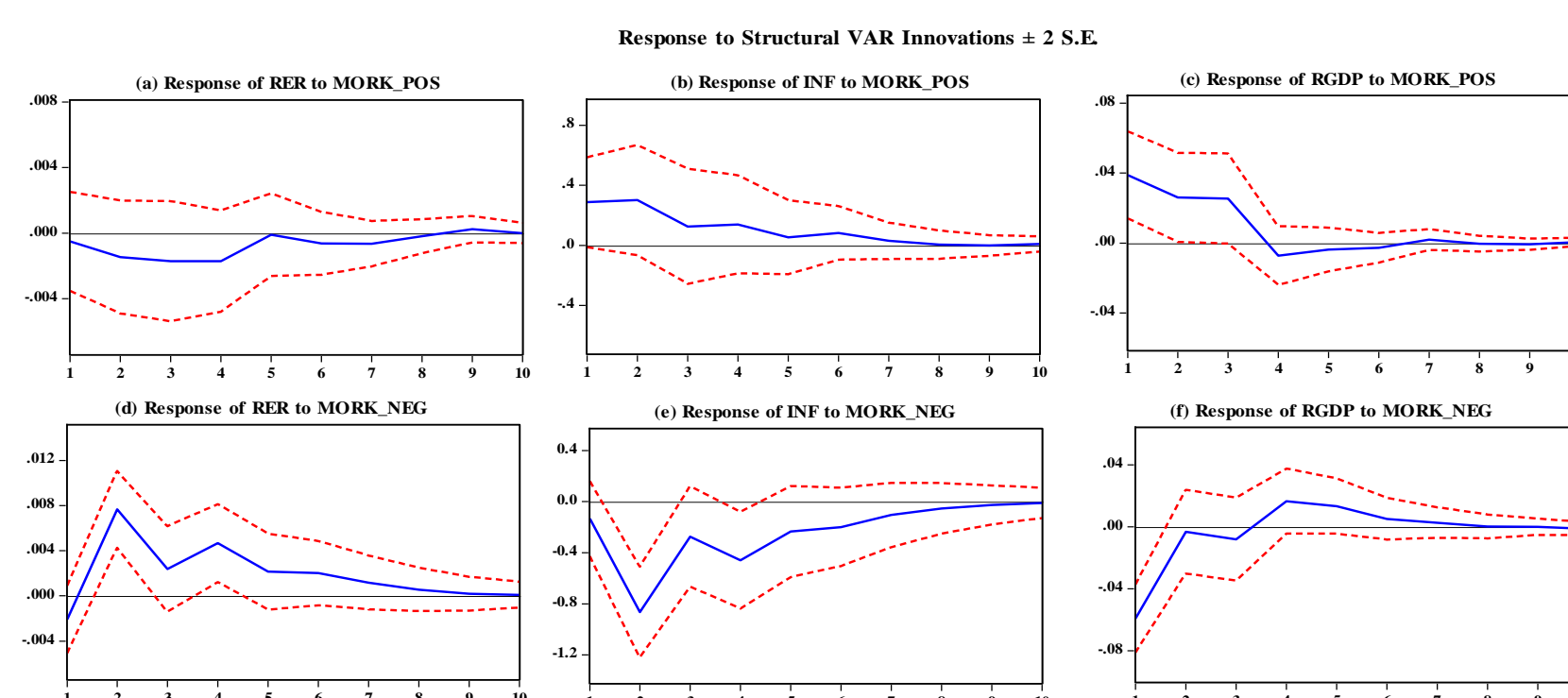


Fig. 2. Response of real Exchange rate, Inflation rate and total real GDP to asymmetric real oil prices shocks (Real oil prices increases and decreases, Mork (1989) definition).

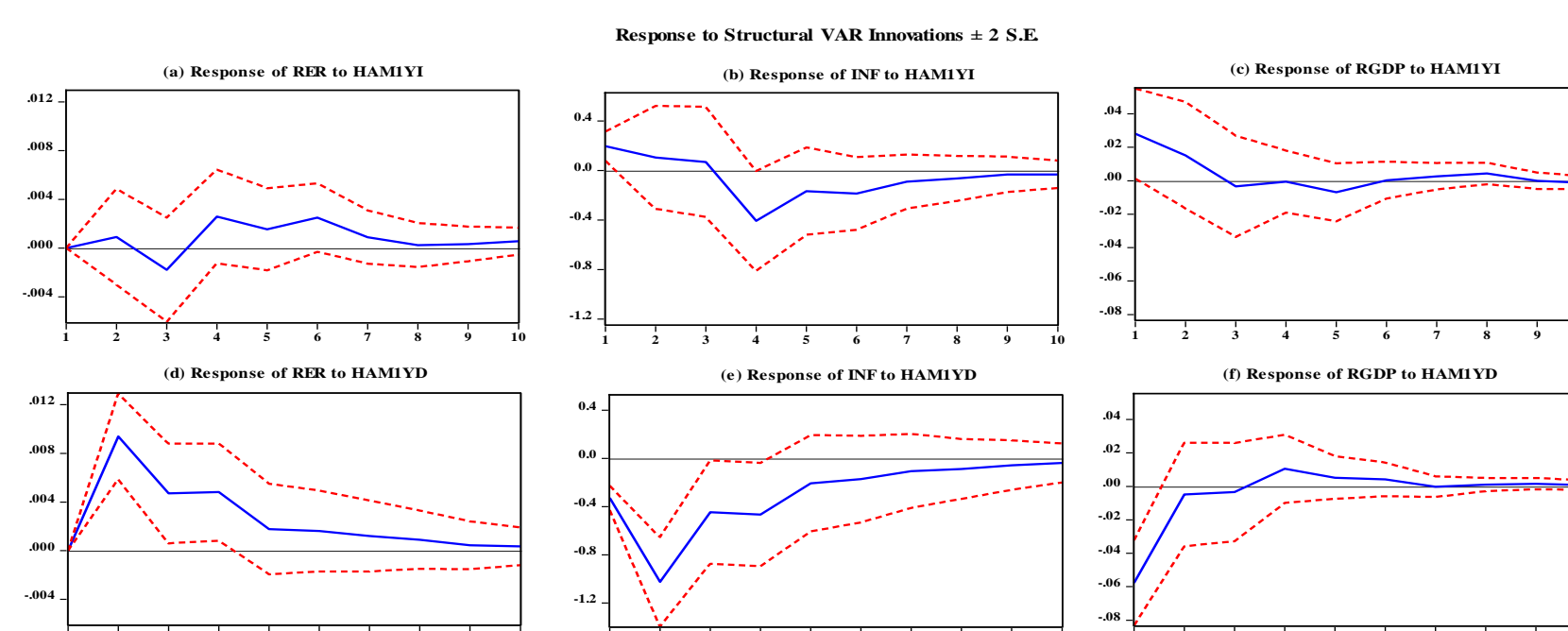


Fig. 3. Response of real Exchange rate, Inflation rate and total real GDP to asymmetric real oil prices shocks (Net oil prices increases and decreases, Hamilton (1996) definition).

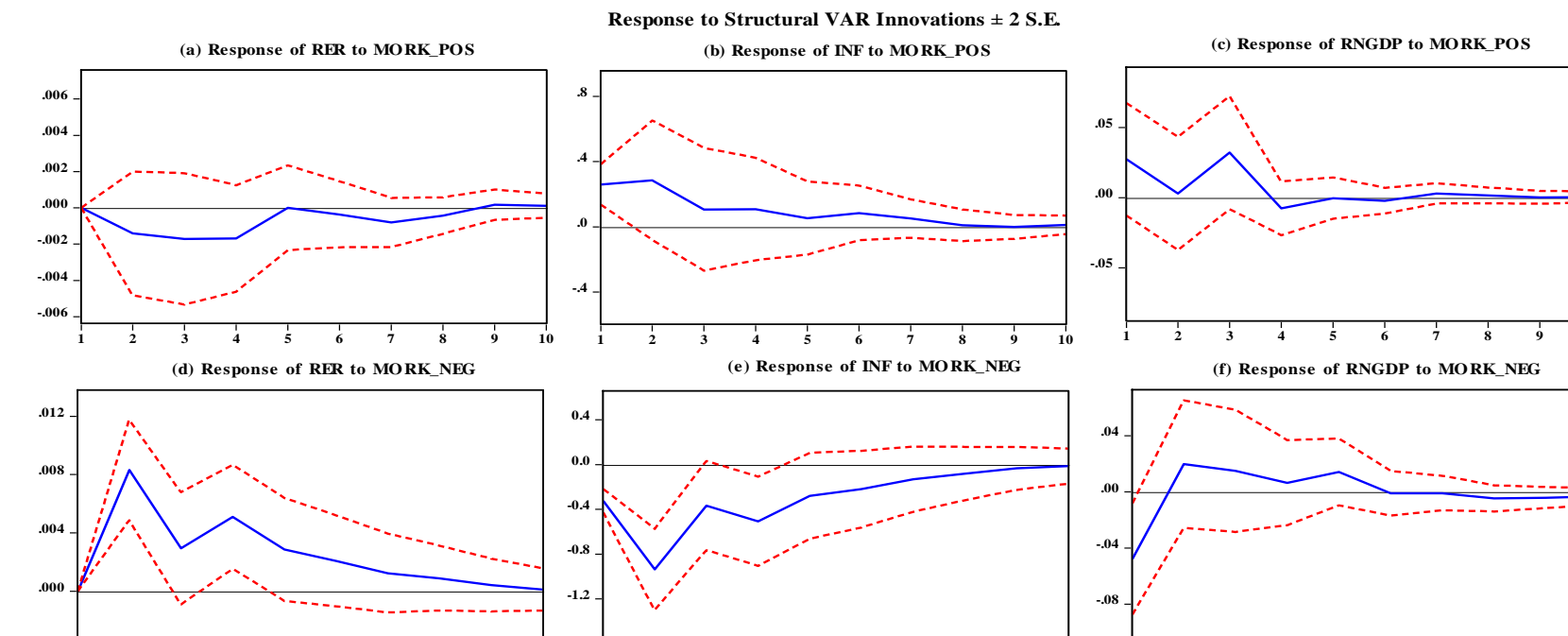


Fig. 4. Response of real Exchange rate, Inflation rate and non-oil real GDP to asymmetric real oil prices shocks (real oil and gas revenues increases and decreases, Mork (1989) definition).

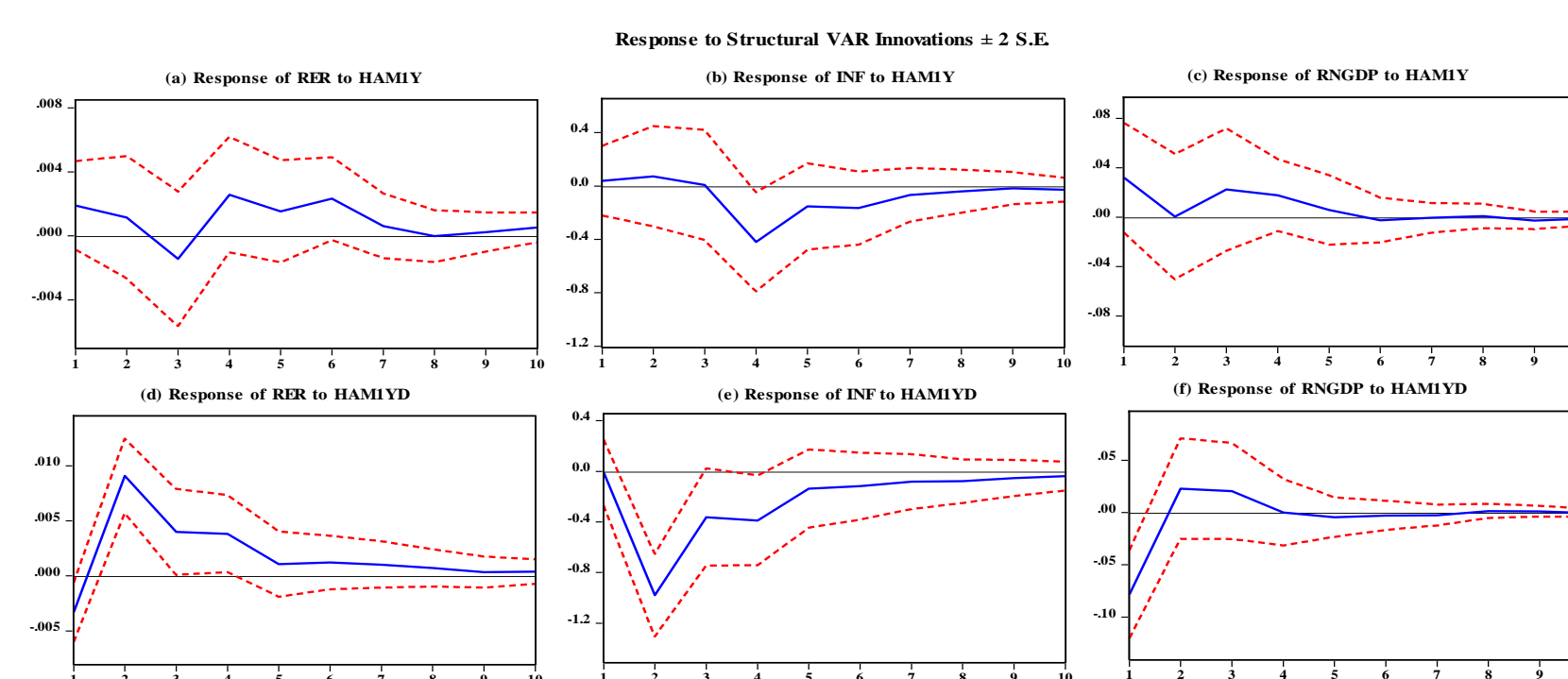


Fig. 5. Response of real Exchange rate, Inflation rate and non-oil real GDP to asymmetric real oil prices shocks (Net oil and gas revenues increases and decreases, Hamilton (1996) definition).

#### 2. NARDL model results (Short- and Long-run)

##### Short-run:

- Real oil and gas revenue increases have a significant impact on the Qatar economic diversification. (Table 1)
- Oil and gas revenues decreases does not have a significant on non-oil economic activity. (Table 1)

**Long-run:** Only positive oil and gas revenue changes have a significant impact on non-oil real GDP (1% increase in real oil and gas revenues raises the non-oil real GDP by 0.71%). (Table 1)

➔ The insignificant effect of oil and gas revenues decrease on the non-oil real GDP indicate the resilience of the Qatar economic to period of oil price decreases.

Table 1: NARDL estimation results for the real oil and gas revenues.

Total Real GDP		Non-oil Real GDP			
Coef.	Std. Error	Coef.	Std. Error		
<b>Panel A: Estimated coefficients</b>					
$\rho$	-0.285***	0.044	$\rho$	-0.354***	0.053
$\beta^+$	1.210***	0.073	$\beta^+$	0.718***	0.160
$\beta^-$	0.839***	0.072	$\beta^-$	0.261	0.206
$\omega$	1.989***	0.590	$\omega$	-0.268	0.894
$\tau$	-0.007	0.011	$\tau$	-0.080	0.058
Intercept	20.632***	0.954	Intercept	23.075***	1.417
$\Delta LROGR^+$	0.959***	0.051	$\Delta LROGR^+$	1.049***	0.145
$\Delta LROGR^+(-1)$	-0.137***	0.049	$D_{2003}$	0.220***	0.062
$\Delta LROGR^-$	0.555***	0.061	$D_{2005}$	0.149**	0.062
$\Delta LROGR^-(-1)$	-0.267***	0.063			
$\Delta LROGR^-(-2)$	-0.114*	0.067			
$\Delta LROGR^-(-3)$	-0.234***	0.071			
$D_{2008}$	0.076***	0.015			
$D_{2014}$	0.039*	0.022			
$\sum_{j=0}^1 \phi_j^+$	0.822 (0.000)		$\sum_{j=0}^1 \phi_j^-$	1.049 (0.000)	
$\sum_{j=0}^1 \phi_j^-$	0.050 (0.283)			0	
<b>Panel B: Diagnostics (p-value)</b>					
ARCH	0.905			0.146	
BG	0.266			0.094	
J-B	0.000			0.008	
RESET	0.070			0.278	
Adj - R <sup>2</sup>	0.896			0.566	

For the case of total real GDP, the nonlinear error term is given by  $Z_{t-1} = LRGDP_{t-1} - \beta^+ LROGR_{t-1}^+ - \beta^- LROGR_{t-1}^- - \omega LRER_{t-1} - \tau INF_{t-1}$ . ARCH refers to heteroscedasticity test. BG is the Breusch-godfrey serial correlation test. RESET is the Ramsey test of misspecification. For the last three tests, we use a lag length equal to 2. (\*) in parenthesis is the p-value of the test statistic of the nullity of the sum of the significant coefficients.  
\* Indicates significance at the 10% level.  
\*\* Indicates significance at the 5% level.  
\*\*\* Indicates significance at the 1% level.

### Policy Implications

The implications and proposed recommendations of our empirical findings are:

- Pursuing the process of economic diversification and increasing its speed mainly in periods of rising oil and gas revenues (because of the positive impact of O&G revenues on RNGDP).
- Moving from a pegged local currency with the US. dollar to a more flexible Currency regime (the monetary authorities will re-gain the monetary policy).
- The resilience of the Qatar economy offers a great opportunity to Qatari policymakers to promote the development of some specific non-oil sectors that are characterized by their higher comparative advantages.
- Attracting foreign investors and encourage the creation of local small and medium-sized enterprises to support the development of non-hydrocarbon activities.



### Conclusions

Our study shows that real oil and gas revenues increases have a positive and highly significant impact on the non-oil sector, which indicate the success at re-investing the oil and gas revenues for promoting and developing the non-oil sectors. Furthermore, the insignificance of the coefficient associated with the real oil price decreases indicates the resilience of the Qatar economy and the success of Qatari policymakers in diversifying their economy.

### How to find the paper?

Charfeddine, L., & Barkat, K. (2020). Short-and long-run asymmetric effect of oil prices and oil and gas revenues on the real GDP and economic diversification in oil-dependent economy. *Energy Economics*, 104680. (Q1, WoS. ISI-IF=4.15, Scopus, A\* in ABDC and 3 in JGR).



Short- and long-run asymmetric effect of oil prices and oil and gas revenues on the real GDP and economic diversification in oil-dependent economy\*

Lanouar Charfeddine \*, Karim Barkat

Department of Finance and Economics, College of Business and Economics, Qatar University, P.O. Box: 2713, Doha, Qatar.

#### ARTICLE INFO

Article history:  
Received 31 July 2018  
Received in revised form 13 December 2019  
Accepted 7 January 2020  
Available online 11 January 2020

#### Keywords:

Total real GDP  
Non-oil real GDP  
Oil and gas revenues  
AB-SVARX  
NARDL

#### JEL classification:

C22  
O11  
O43  
O48

#### ABSTRACT

The aim of this paper is to explore the short- and long-run asymmetric impact of oil prices shocks and oil and gas revenues changes on the total real GDP and the level of economic diversification of the Qatar economy. To this end, two econometric approaches have been used: (1) the A-B structural vector autoregressive (AB - SVARX) model with exogenous variables where four different asymmetric oil prices and oil and gas revenues measures have been employed, and (2) the nonlinear autoregressive distributed lag (NARDL) model. The results show that, in the short-run, the responses of both total real GDP and non-oil real GDP to negative shocks on real oil prices and real oil and gas revenues are higher than the impact of positive shocks, indicating evidence for the existence of asymmetric impact of shocks in the short-run. However, the results suggest that the impact of shocks does not last more than three quarters. This evidence for the existence of asymmetric behavior is also confirmed by the NARDL analysis, which shows that, in the long-run, positive oil prices shocks and oil and gas revenues changes have higher impact on the two proxies of economic activity than negative changes do. A result that confirms the resilience of the Qatar economy to negative shocks and the positive role played by the energy sector in improving the Qatar economic diversification degree. Finally, the results show that the non-oil sector is completely resilient to negative shocks in the long-run as the impact of negative shocks are insignificant on the non-oil real GDP. Several policies aimed to improve the level of economic diversification of the country and delink the government revenues from oil and gas revenues are proposed and discussed.