Sources of Macroeconomic Fluctuations in MENA Countries

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ABSTRACT

A close examination of the MENA region economies reveals a number of fundamental sources of macroeconomic fluctuations. These include economic factors such as exchange rate instability, large public debt, current account deficits, and escalation of inflation. The political factors such as government instability, corruption, bureaucracy, and internal conflicts also are major sources of macroeconomic instability. Thus, the sources of macroeconomic fluctuations in these countries are expected to be inhomogeneous. This paper determines sources of macroeconomic fluctuations for 16 MENA economies using a structural VAR model. By imposing long-run restrictions on a VAR model, we identify four structural shocks: nominal demand, relative demand, supply, the world output, and imported input price shocks. Overall, the results show some similarities for the source of macroeconomic fluctuations in these, but also some important differences as well. We find important differences even among countries with similar macroeconomic conditions, such as the oil exporters and oil importers. Although, oil prices and world output are significant sources of macroeconomic fluctuations in oil exporters, in almost all countries they do not have the highest share. There is one clear common finding of the paper: For all countries, the long-run sources of output fluctuations are the real supply and/or real demand shocks. External shocks are secondary for all countries. The sources of short-run and price fluctuations are inhomogeneous and dominant variables are mostly determined by country specific factors.

1. Introduction

An important question in applied macroeconomics is to quantify the sources of macroeconomic fluctuations. Evidence on the relative magnitudes of various factors can guide policy-makers who must decide how closely to track various external and internal developments as well as theorists who want to know what kind of shocks to incorporate into their models. A related goal is to assess the relative importance of external shocks as apposed to internal shocks.

In recent years, understanding and distinguishing among the various factors affecting the short- and long-run behavior of macroeconomic time series in the Middle East and North Africa (MENA) region has been one of the rapidly growing research areas. Using a variety of econometric techniques, a substantial body of literature has documented various relative magnitudes to the several potential sources of macroeconomic fluctuations for the MENA countries. Some studies concentrate on the determinants of economic growth (Abed and Davoodi, 2003; Makdisi, Fattah, and Limam, 2003; Hakura, 2004; Tamberi, 2005) while others consider how increasing trade and financial linkages affect various economic outcomes in the region (Abed and Davoodi. 2003; Hirata, Kim, and Kose, 2004). Some recent studies document the main features of business cycles in the MENA countries (Hirata, Kim, and Kose, 2004; Sayan, 2004; Süssmuth and Woitek, 2004; Lucke, 2004; Al Zoubi and Maghyereh, 2005; Hirata, Kim, and Kose, 2007). A collection of papers focusing on issues such as the demographic transition to the financial liberalization process in the MENA region can be found in Iqbal (2001). Shafik (1998) also provides a collection of papers on the dynamics of economic growth, transitional issues, poverty, and environment in the MENA region.

The volatile changes in the MENA region economies during the last three decades created controversies about the relative importance of potential sources of macroeconomic fluctuations. Several studies attribute a significant role to terms of trade shocks and external linkages (Makdisi et al. 2003; Diboglu and Alesia, 2004; Hirata et al. 2004 and 2007). Using a similar structural vector autoregressive (SVAR) model approach as in our study Hoffmaister and Roldos (1997) and Ahmed and Loungani (1998) study the sources of macroeconomic fluctuations in developing countries and find that terms of trade and world output shocks play a significant role.

Mehrara and Oskoui (2007) used a SVAR model to examine the sources of macroeconomic fluctuations in five oil-exporter MENA countries. They found that the oil price shocks are the main source of output fluctuations in Saudi Arabia and Iran, but not in Kuwait and Indonesia.

Some other studies pointed out the significant role played by real demand shocks—fiscal imbalances and real exchange rate misalignments—in the MENA region countries (Domaç and Shabsigh, 2001; Nashashibi, Brown, and Fedelino, 2001; Jalali-Naini, 2000). The primary objective of this paper is to investigate the sources of macroeconomic fluctuations in the MENA region. There is a spreading view in the literature that the external shocks play the most important role in macroeconomic fluctuations for the MENA region countries. Monetary policy has been also believed to be destabilizing for a long time. Using a small open economy model tailored to the MENA region economies we estimate the relative importance of external shocks (foreign input price and world output), nominal demand shocks, fiscal shocks, and domestic supply shocks using data on 16 countries (see Table 1). Our analyses show that the external shocks—terms of trade proxied by oil prices and the world output—play the second most important role for countries that heavily depends on oil exporters. Our results are complimentary to Mehrara and Oskoui (2007) for Saudi Arabia, but we find that the role of oil prices in macroeconomic fluctuations in Kuwait is comparable to their role in Saudi Arabia. Our results also show that the oil prices do not contribute much to macroeconomic fluctuations in Iran. A most important finding of the paper is the significant role of supply shocks in output fluctuations. We also find that the increased public debt by affecting the relative demand has been the major contributor to the macroeconomic fluctuations in these countries. Not strikingly our estimates show that the macroeconomic fluctuations in the MENA countries largely depend on macroeconomic policies in the individual countries.

We estimate that external shocks account for about 1–15% of the short-run variance in domestic output. The long-run estimate varies from 1% to 25%. The external shocks explain 1-45% of variance of the aggregate price level in the short-run while they explain more than 35% in the long-run, mostly due to the changes in oil prices. Nominal shocks explain 12-95% of the variance of the domestic price level in the short run. In the long-run, they explain less than 60% of the variation in the price level in most countries. The contribution of fiscal shocks to the short-run variance of the output varies from 1% to 75% across the countries. The long-run estimate is less than 10% for most countries and less than 20% for all countries. The short-run estimate for the price level is from 2% to 50%, whereas the long-run estimate is less than 30%, except two countries. The contribution of supply shocks to long-run real output fluctuations varies from 50% to 85%, and it is above 50% for all countries except one country (Kuwait). Thus, we find that a sizable fraction of the variation in real aggregate output and aggregate price level in the MENA countries can be attributed to the supply shocks. The fluctuations in the price level are also mostly due to the nominal demand shocks. Thus, our findings are consistent with the real business cycle theory of Kydland and Prescott (1982), Long and Plosser (1983), and Prescott (1986). Our findings are also complementary to the findings of Agénor, McDermott, and Prasad (1998), where it has been found that the supply side shocks are driving business cycles in developing countries.

The paper is organized as follows. Section 2 outlines the approach used for investigating the sources of output fluctuations in the MENA countries. Section 3 presents the empirical results derived from the impulse response analysis of shocks and their variance decompositions. Section 4 concludes.

2. A SVAR Model for the MENA countries

The MENA region economies can be grouped into two broad categories as the oil-rich and oil poor. Terms of trade shocks are considered to be major source of macroeconomic fluctuations for countries in both groups linkages (Makdisi et al. 2003; Diboglu and Alesia, 2004; Hirata et al. 2004 and 2007). Thus, countries in both groups are highly dependent on the world input prices which could be well approximated by real oil prices. These countries are also highly dependent on the foreign demand due to large current account deficit and/or increasing share of exports in real GDP. To study the sources of macroeconomic fluctuations in MENA region economies, we follow SVAR approach proposed by Blanchard and Quah (1989) and extended to open economies by Ahmed et al. (1993), Bjørnland (1998), and Hoffmaister and Roldós (2001). We propose a SVAR model that contains five variables; log of real oil price (p^f_{mt}), log of real world output (y^f_t), log of real domestic output (y_t), log of real effective exchange rate (q_t), and log of consumer prices (p_t). This model captures the fragility of the MENA region economies by extending the Blanchard and Quah model to incorporate external shocks via the inclusion of variables p_{mt}^f and y_t^f . Thus, the model incorporates effects of shocks from world input prices and world output. To be consistent with the assumption of a small open economy, domestic shocks are not allowed to affect the world variables. The structural model used can be expressed as follows:

$$\Delta x_t = C(L)\varepsilon_t \tag{1}$$

where $\Delta x_t = (\Delta p_{mt}^f, \Delta y_t^f, \Delta y_t, \Delta q_t, \Delta p_t)'$ and Δ indicate the first differences. Consistent with the common findings in the literature we assume that all variables are nonstationary, integrated of order 1, *I*(1), and the variables are not cointegrated in levels[1]. In this equation *C*(*L*) is an infinite order matrix lag polynomial defined as $C(L) = C_0 + C_1 L + C_2 L^2 + \ldots$ in the lag operator *L* and C_0 is an identity matrix. The observed fluctuations in the vector of five variables $x_t = (p_{mt}^f, y_t^f, y_t, q_t, p_t)'$ are due to five uncorrelated structural shocks $\varepsilon_t = (\varepsilon_t^{mf}, \varepsilon_t^{yf}, \varepsilon_t^{y}, \varepsilon_t^{q}, \varepsilon_t^{p})'$ with $E[\varepsilon_t \varepsilon_t'] = I$.

The model identifies five structural shocks. The external shocks are the shocks in the input prices proxied by real oil price, ε_t^{mf} , and the world output, ε_t^{yf} . The model identifies three domestic shocks: supply shocks, possibly including the structural reforms such as tariff and trade reforms, ε_t^{y} , relative demand shocks arising from changes in public spending/debt and relative preferences, ε_t^{q} , and aggregate demand shock, which captures the effects of nominal variables, ε_t^{p} .

Consider the long-run effects of structural shock by setting *L*=1 in equation (1):

$$C(1) = \begin{bmatrix} C_{11}(1) & C_{12}(1) & C_{13}(1) & C_{14}(1) & C_{15}(1) \\ C_{21}(1) & C_{22}(1) & C_{23}(1) & C_{24}(1) & C_{25}(1) \\ C_{31}(1) & C_{32}(1) & C_{33}(1) & C_{34}(1) & C_{35}(1) \\ C_{41}(1) & C_{42}(1) & C_{43}(1) & C_{44}(1) & C_{45}(1) \\ C_{51}(1) & C_{52}(1) & C_{53}(1) & C_{54}(1) & C_{55}(1) \end{bmatrix} \tag{2}$$

[1] The nonstationarity and no cointegration assumptions are verified, but not reported here for brevity. The results are available upon request.

We need 10 long-run restrictions imposed on this matrix for the structural model to be just identified (see Balanchard and Quah, 657). As in Parente and Prescott (1994) we include world output, y_t^f, in our model to capture the technological spill over effect from industrialized countries. The real price of oil, p_{mt}^f, is included in the model since the long-run level of domestic output depends on the domestic price of imported intermediate inputs. An increase in the price of intermediate inputs acts like a negative Hicks-neutral technological change for oil importers and it may serve as a positive Hicks-neutral technological change for oil exporters. Higher revenue streams from increased oil prices can finance productive physical and social investment, and therefore improve economic growth. Both the world output and oil price shocks are significant for all the MENA region countries since all of these are small open economies. The long run impact of these two shocks will show the significance of foreign shocks for macroeconomic fluctuations. We assume that an expansion in the long-run world output would not affect the relevant intermediate inputs in a differential way so that their relative price does not change. This implies that $C_{12}(1) = 0$. Consistent with the assumption of a small open economy, we assume that the domestic shocks do not affect he world output and world input prices in the long-run (essentially also in the short-run), implying that $C_{13}(1) = C_{14}(1) = C_{15}(1) = C_{23}(1) = C_{24}(1) = C_{25}(1) = 0$.

In this model fiscal expansion leads to real exchange rate appreciation changing the composition of demand towards non-tradable goods. Thus, the effect of fiscal policy shock in our model is captured by inclusion of the real exchange rate, q_t. We assume that fiscal polices have ambiguous effect on the real domestic output, y_t.

In order to allow nominal variables as a source of short-run macroeconomic fluctuations, which the literature overwhelmingly consider to be highly relevant case for the MENA countries, the real money supply needs to be added to the model. However, this is not necessary since the SVAR model we estimate only requires the restriction implied by the long-run neutrality of money and the nominal exchange rate to capture the effects of nominal shocks. Further, the explicit modeling of money and nominal exchange rate for these countries complicated since variety of different monetary policy regimes and at least four different exchange rate regimes during our sample are adopted in various countries. In order to avoid these complications we restrain from explicit specification of nominal variables and add a general equation for the evaluation of the domestic price level, p_t. The price level variable is determined by the response of monetary authorities to external shocks, fiscal and other polices, as well as other exogenous nominal shocks.

The long-run domestic output is determined by the supply factors and unaffected by the demand shocks, implying that $C_{34}(1) = C_{35}(1) = 0$. Finally, the long-run level of real exchange rate is determined by supply and relative demand not by aggregate demand or nominal shocks, which implies the last restriction $C_{45}(1) = 0$ in our model. This assumption is also consistent with the assumption of perfect capital mobility. Under perfect capital mobility, aggregate demand shocks have no long-run effect on real money balances and real interest rate, therefore no effect on the real exchange rate through shocks in the price level. Most countries in our sample have liberalized the current account and the assumption of perfect capital mobility is realistic is not unrealistic during the most of our sample period.

Incorporating these ten restrictions on the 25 × 25 matrix $C(1)$, the long-run effect of the five shocks on the endogenous variables are given by

$$\begin{bmatrix} \Delta p_{mt}^{f} \\ \Delta y_t^{f} \\ \Delta y_t \\ \Delta q_t \\ \Delta p_t \end{bmatrix} = \begin{bmatrix} C_{11}(1) & 0 & 0 & 0 & 0 \\ C_{21}(1) & C_{22}(1) & 0 & 0 & 0 \\ C_{31}(1) & C_{32}(1) & C_{33}(1) & 0 & 0 \\ C_{41}(1) & C_{42}(1) & C_{43}(1) & C_{44}(1) & 0 \\ C_{51}(1) & C_{52}(1) & C_{53}(1) & C_{54}(1) & C_{55}(1) \end{bmatrix} \begin{bmatrix} \varepsilon_t^{mf} \\ \varepsilon_t^{yf} \\ \varepsilon_t^{y} \\ \varepsilon_t^{q} \\ \varepsilon_t^{p} \end{bmatrix} \tag{3}$$

The specification in (3) particularly attempts to capture recent trends in the MENA region economies by allowing the real exchange rate shock particularly enter the equation. The real exchange rate shock, ε_t^q, is a composite shock that includes exogenous changes in the foreign interest rate, changes in the currency risk premium, as well as exogenous changes in the balance of payments.

3. Empirical Results

Our data set spans the period from 1960 to 2006, but the sample period may vary for some countries depending on the data availability. We classify 16 MENA countries (see Table 1) into five major groups: (1) oil rich labor importing (G1: Kuwait, Oman, Saudi Arabia), (2) oil rich labor abundant states (G2: Algeria, Iran, Syria), (3) oil poor labor abundant NICs (G3: Egypt, Malta, Mauritania, Morocco, Pakistan, Turkey), (4) oil poor limited natural resource states (G4: Israel, Jordan, Tunisia), and (5) natural resource poor states (G5: Sudan). All data except the crude oil price were obtained from the World Development Indicators (WDI), International Financial Statistics (IFS), and the Central Bank of the Republic of Turkey Electronic Data Distribution System (CBRT-EDDS). The crude oil price data were taken from the British Petroleum Statistical Review of World Energy workbook (June 2007). The real effective exchange rate (REER) data were not available for some countries and calculated by the authors as the product of the ratio of imports of goods and services of each country in national currency to imports of goods and services of country in US dollar and the ratio of producer price (PPI) index in United States to consumer price index (CPI) of home country. The GDP deflator for home country is used instead of CPI whenever the CPI was not available. All variables are measured in a logarithmic scale. The unit root test shows that all the variables are stationary in levels and therefore differences to transform into stationary series. The Johansen test indicates that the null of a zero cointegrating relationship cannot be rejected at the 1% level.

In order to determine the appropriate lag length we estimated the reduced form VAR model, by restricting the lag length between one and four. On the basis of the Bayesian (BIC) and the Hannan-Quinn (HQ) Information Criteria (HQ), the sample evidence for the entire reduced form VAR system suggested a lag length of one for all countries. A series of sequential likelihood ratio tests for a shorter lag length versus a longer lag length, suggested also a lag length of one. The *p*-value of the Portmanteau test for residual autocorrelation ranges from 0.08 to 0.85 for a lag length of 8 and 0.02 to 0.47 for a lag length of 16. The normality of the residuals is rejected using the multivariate normality test of Doornik and Hansen (1994). Given that the evidence for residual autocorrelation is weak and our sample sizes were mostly around 45 we decided estimate the VAR models with a lag length of one for all countries. The VAR models were estimated using the Seemingly Unrelated Regression (SUR), rather than Ordinary Least Squares (OLS), owing to the inclusion of zero restrictions on some lagged variables (which results in inefficient OLS estimators when the residuals are correlated across equations).

Given the potential for structural breaks in the sample, conditional on constant variances, we test the parameter stability of each equation in the VAR models. We performed a series of Wald-tests, developed by Andrews (1993), by allowing the break point to vary between observations corresponding approximately to 15 and 85% of the sample period from the beginning of the sample. These tests, conditional on constant variances, do not suggest evidence of parameter instability in general. The Chow break point test does not also suggest parameter instability. However, parameter instability is rejected for Egypt, Kuwait, and Iran.

Ahmed and Park (1994) impose only long-run restrictions of the small open economy assumption. However, the small open economy assumption may need to be imposed in the short-run as well. Following Hoffmaister and Roldós (2001), we assume that small open economy assumption in essence implies independence of world output and world input prices from the domestic shock both in the short- and long-run. The imposition of short-run restrictions implies a near reduced form VAR model that is block exogenous in the world output and world input prices. These "over-identifying" restrictions are tested using the multivariate Granger-Sims causality tests. The over-identifying test statistics has a value of 14.34 and distributed as a χ^2 statistics with 6 (three domestic variables each with two lags) degrees of freedom. Thus, the block exogeneity of the world output and world input prices are not rejected. Therefore, we impose this restriction on the SVAR model we estimate next.

Impulse Response Analysis

We turn now to an analysis of the dynamic characteristics of the model itself, and therefore the validity of the structure of the SVAR model, by estimating impulse response functions (Hamilton, 1994). Each variable in our model can be expressed as a combination of current and all past errors. We analyze the dynamic response of domestic variables, y_t, q_t, and p_t to a one standard deviation shock in the five structural shocks identified in the model, that is, the world price of imported materials proxied by real oil price, ε_t^{mf}, the world output, ε_t^{yf}, domestic supply shocks, ε_t^{y}, relative demand, ε_t^{q}, and aggregate demand shock, ε_t^{p}. The impulse responses are given in Figure 1. We calculated the confidence intervals for the impulse responses using the bootstrap method of Hall (1992), but these are not reported for clarity and brevity. The impulse response functions are normalized such that zero represents the steady-state value of the response variable.

An oil price shock

Nine countries in our data highly depend on imported inputs, most importantly particularly on the oil imports. The remaining seven countries are oil exporters and also highly dependent on the oil prices. In our context one can interpret the oil price shock as a terms of trade shock as well, since oil is the major source of fluctuations in the terms of trade. A terms of trade change could originate from a rise in the price of exports or a fall in the price of imports. Generally, emphasis has been placed upon import price, as this has been the historical experience for most of the period we are concerned with. The impulse responses due to one standard deviation shock in oil price are presented in the first parts of Figure 1. These impulses are generally consistent with the expectations. These responses suggest that the oil price shocks in the MENA region are quite consistent with the "supply shock" view of the input prices; for oil importers output falls, the real exchange rate depreciates, and prices increase, which are clearly supported by the impulse responses in Figure 1.

The impulse responses of domestic variables to oil price shocks across countries in different groups are mostly similar with some exceptions. Price levels increase in response to a positive shock in oil prices in all countries. This is the expected result for countries that depend on oil imports (countries in Groups 3, 4, and 5). However, a positive response in the price levels is also observed for oil rich countries, except Syria and Iran.

The response of real GDP to oil price shocks is quite dissimilar across and within the group of countries. One may expect a positive response for oil rich countries, on the one hand, and, a negative response in oil poor countries, on the other hand. Our results are consistent with the expectations for the oil rich countries, except one country in Group 1 (Kuwait), but there are some exceptions for oil poor countries in Groups 3, 4, and 5, which response unexpectedly. These unexpected responses are however not significant at 5% significance. Thus, for these countries we may at best observe no response of domestic output to oil prices.

There is not an expected result for the response of real exchange rate to oil price shocks. The REER appreciates in some either oil rich or poor countries. In each group there are also countries experiencing REER depreciation such as Kuwait, Syria, Turkey, Jordan, and Sudan.

The highest responding variables to oil price shocks vary across groups and within groups. For instance, the highest response come from real GDP in the oil rich labor importing states, while the most responsive variable to oil price shocks is the price level in oil poor labor abundant states. Finally, with some exceptions, the responses to oil price shocks are generally long lasting. This is consistent with the supply-shock view of the oil price shock. Only GDP of Sudan and Israel, and REER of Algeria, and Malta readjust to their steady states.

A world output shock

Figures 1 also shows the responses to a positive shock in the world output. The estimates of the responses to world output shocks indicate that among the oil rich countries only in Saudi Arabia and Algeria we observe a significant output response. Additionally, almost in all countries the price levels positively respond to a positive shock in the world output. In the other oil poor groups, in general, we observe similar responses to world output shocks. However, we notice that in some oil poor countries output responds positively to a shock in the world output while there are not significant responses in the price levels (Morocco and Mauritania in G3, Tunisia in G4). This is not possible to observe in oil rich groups.

The responses of the reel exchange rates to a positive shock in the world output are analogous to the responses of the price levels, that is the responses vary across and within the group. In some countries we observe appreciation while the real exchange rate depreciates in other countries. In oil rich countries, highest responses to the supply shock come from domestic output and REER (G1 and G2, respectively). On the other hand, in the oil poor labor abundant countries responses are analogous to G2 countries. In the states with limited natural resources, the highest responses to world output come from domestic prices.

A supply shock

The clearest picture of the impulse responses in Figure 1 is the response of domestic outputs to supply shocks. The previous studies on the MENA countries in general attributed most of the fluctuations in the output to external shocks and/or the demand shocks. Our findings show significance counterevidence against this finding. Our results confirm the findings of Agénor et al. (1998). The dynamics of adjustment to a supply shocks have the expected sign and confirm the relative importance of these shocks. Almost all variables in all groups show significant response to supply-side shocks. The effect of supply shocks on the domestic output is long lasting and in general approaching the permanent level in about 4 to 8 years. Domestic supply shocks have the largest and longest impact on the domestic output levels. The supply shock expands domestic output permanently as expected. A positive supply shock also decreases the price level permanently in more than half of the countries. There are some countries with a positive price response to output shocks, but except for Israel none of these responses are long lasting and significant. The responses of real exchange rates to supply shocks, appreciation in general, are also permanent except Kuwait in G1 and Syria in G2). In few cases there is evidence of depreciation but none of theses are significant. In summary, the responses most common to all the MENA countries are the responses to supply shock. Further, these responses are permanent and mostly significant.

A relative demand shock

The responses to shock in relative demand, public spending/debt changes are presented in Figures 1. As expected the higher public spending/debt cash rate results in increased real domestic output with significant effect up to 4 years and increased inflation about the same length with some more uncertainty. The impact on output seems to be stronger than prices, reflecting the fact that some of the increased demand will be absorbed by an increase in imports as the domestic currency also appreciates.

Contrary to most of the responses to shocks in oil price, world output, and domestic output, the relative demand shocks have short effects on all domestic variables in every country in each group. This is a second common finding of this study. With some exceptions, the domestic outputs readjust to steady states in 8 years.

On the price side, the responses are in general positive and long lasting in oil rich labor importing countries. There are a few exceptions in the oil rich and labor abundant countries where the responses are initially negative but not significant. This also seems true for some of the oil poor states (except Egypt, Malta, Morocco, and Turkey in G3). Finally, the highest responses to relative demand shocks come from the real exchange rates. This should not come as surprise since the effect of fiscal shocks should be significantly felt on the real exchange rates. The real exchange rates appreciate in all countries and the effects are permanent lasting up to 20 years.

An aggregate demand shock

Responses to an aggregate demand shock are displayed in Figures 1, support what would be the conventional wisdom about nominal demand shocks, with inflation rising and the real exchange rate depreciating. This is clearly the case for all countries in each group. The responses of outputs to aggregate demand shocks are insignificant and ignorable even in the short-run. The response of prices is fast, where the full effect is realized in less than 8 years, and permanent which confirms the conventional view that monetary expansion will only increase the price level permanently in the long-run. The domestic currencies respond for up to 4 to 8 years during which the price level did not still raise the long-run level yet. After the price level rises to the long-run level after 4 to 8 years the domestic currencies adjust back to the level before the aggregate demand shock. Our finding about no significant responses of outputs to monetary aggregate demand shocks even in the short-run may be somewhat unexpected conventionally, but there are certainly theoretical explanations in the literature. The long years of inflation in some of these countries rendered monetary expansion completely ineffective in raising the output, as the expectations and prices adjust quickly to such changes.

Variance Decompositions

We next turn to the forecast error variance decomposition of the three domestic variables, real GDP, real exchange rate, and price level. The decomposition of variance evaluates the relative importance of each of the structural innovations in the fluctuations of the variables at different time horizons. The information contained in decomposition of variance can be equivalently represented by impulse response functions. These variance decompositions are given in Table 2.

Domestic output

The forecast error variance decompositions for real output suggest that output fluctuations in the MENA countries are primarily due to supply and secondly to oil price shocks, implying that these countries are somewhat vulnerable to external shocks. In the first year, supply shocks explain up to 97% of output fluctuations

(Pakistan), and for all other countries contribution of the supply shocks to output variance is more than 50%. The effect of supply shocks are permanent and stay around the same level. In the long-run, oil price shocks are the second most important sources of output fluctuations, explaining about 10-33% of the output fluctuations for oil exporters. For Oman and Saudi Arabia the world output explains about 20 to 30% of the variance in output. For other countries, the results are not homogenous. For some countries relative demand shocks play an important role (Isreal and Jordan), while aggregate demand shocks are quite important in some countries in the short run (Egypt, Syria, and Jordan). This finding confirms the conventional view that the fiscal policies might be major source of changing economic activity while aggregate demand shocks may significantly contribute to output fluctuations in the short-run. Although the importance of the oil price is known, its contribution is secondary, even for oil rich countries, in our study. We should point out that our results confirm the supply shock nature of the imported input prices. Overall, most output fluctuations in the MENA countries are primarily due to supply, oil price, and world output shocks in the long-run. The role played by oil price by acting as a supply shock is although known, the significant role played by supply side shocks, and almost no contribution from the nominal shocks in the long-run and even in the short run (with three exceptions) is uncovered by our study. These results are complimentary to findings of Agénor, et al. (1998) for a group of developing countries.

Domestic price level

The forecast error variance decompositions for consumer price index suggest that the nominal shocks at least in the short run play important role in price fluctuations, explaining more than 70% of movements in the short-run in the majority of the MENA countries. The most striking finding across the groups of countries is the difference between G1 and the other groups. In the last four groups, variations in domestic price level are mostly due to nominal shocks, oil price and world output being the second and third important factors, respectively. However, in the G1 group of oil rich countries fiscal shocks are the main source of domestic price fluctuations both in the short- and the long-run. Within the groups, the following points are noteworthy: The supply shocks do not have any effect on the variation in the price level in Malta neither in the short- nor in the long-run. This shock accounts for 22% of the price fluctuations in Turkey both in the short- and long-run. Furthermore, Malta and Turkey are countries depending highly on imported inputs; however, according to the variance decompositions, input price shocks explain 7% of the variation in the price level in Turkey while it explains 22% in Malta in the long-run.

Real exchange rate

The variance decompositions for real exchange rates given in Table 1 imply that, in contrast with other macroeconomic variables in this study, changes in relative demand do play the most important role in determining real exchange rate in the MENA countries. The contribution of fiscal or real demand shocks to fluctuations in the real exchange rate varies from 25 to 95% in both the short- and long-run. The contribution of real demand shock actually is more than 60% for almost all countries. We observe a significant difference among the oil rich and oil poor countries: Oil price shock is the second significant factor explaining about 20 to 30% of the variation in the real exchange rate fluctuations for oil exporters, while its role for oil importers is mixed. There are cases (except G5) where the fiscal shocks lose their effect on the real exchange rate variations over time, while other shocks gain importance (Saudi Arabia (G1), Iran (G2), Malta (G3), and Tunisia (G4)). Nominal shocks contribute less than 10% to the real exchange rate fluctuations in all countries (except Sudan). Thus, the real exchange rates are mostly determined by real demand and oil price shocks in the short-run. These short-run sources of real exchange rate fluctuations are not preserved in the long-run. In the long-run the share of domestic supply shocks and world output increases. The external real shocks play some significant role in real exchange rate fluctuations in the long-run. Moreover, the results suggest that nominal shocks are not important determinants of the behavior of real exchange rates in the long-run. Stochastic shocks to the goods market (IS shocks) can induce excessive real exchange rate volatility. The small role played by nominal factors in explaining real exchange rate fluctuations is consistent with the evidence for some industrial and developing countries (see Lastraps, 1992; Hoffmaister and Roldós, 1997).

4. Conclusion

In this paper we used a small open economy SVAR model in order to examine the sources of macroeconomic fluctuations in the MENA region countries. The model seems to both capture most of the observed features of theses economies over time and uncover valuable information in regard to the response of domestic variables.

Some of our results are not expected by the conventional wisdom. In accordance with the small open economy assumption, and to disentangle the effects of external shocks from domestic shocks, we restrict domestic shocks by not allowing them to affect the world price of intermediate inputs or world output both in the short- and long-run. One of the virtues of this approach is that it allows us to identify and measure the effect of different types of shocks in a unified framework. We impose appropriate long-run restrictions, arising from macroeconomic theory, on the VAR model and identify four structural shocks: nominal demand, relative demand, supply, the world output, and imported input price shocks. The impulse response functions and variance decompositions reveal valuable information about the sources of macroeconomic fluctuations in the MENA countries.

The feature which differentiates this work from its predecessors is the inclusion of external shocks and proper treatment of the assumption of a small open economy. Historical decompositions are used to consider the structure of the macroeconomic fluctuations for the period from 1960 to 2005, showing that, external supply shocks accounted by the shocks to world output and the imported input price shocks, which are proxied by the oil price shocks, do generally contribute significantly to macroeconomic fluctuations in the MENA countries, but they are certainly not the most important source of macroeconomic fluctuations for the oil poor countries. External shocks play an equally important role in output, price, and real exchange rate fluctuations in almost all oil rich countries. However, even in these countries the dominant source of output fluctuations in the long run are the domestic supply shocks.

Our findings to our knowledge are the first to uncover the highly important role played by the supply side shock in the MENA region economies. Although the world output as well as the oil price shocks play a significant role in the long-run macroeconomic fluctuations, the study finds that the supply side shocks are the main source of output fluctuations in the long-run.

The impulse responses and variance decompositions suggest that the world import price shocks are quite consistent with adverse "supply shock" view of the input prices for the majority of the MENA countries; where output falls, the real exchange rate depreciates, and prices increase. In the long-run, aggregate demand shocks do not appear to play any role in output movements in these countries.

Surprisingly, nominal aggregate demand shocks do also fail to affect output even in the short-run in some countries. It seems that after many years of high inflation, prices and wages adjust very quickly leaving no room for an increase in the output. Changes in fiscal policy play moderate and in some countries significant role in the real exchange rate fluctuations in the short- and long-run. Consistent with the conventional wisdom, nominal shocks play the most significant role on price level variations, particularly in the oil poor countries the price level is largely determined by the nominal shocks in the long-run.

Overall the group of oil rich countries does show some similarity in terms of the responses of domestic variables particularly to external shocks. However, the findings for the majority of the MENA countries indicate that except the supply shocks the sources of macroeconomic fluctuations are mostly related to country specific conditions and policies.

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Table 1: Descriptive Statistics

			Meann of the log values		
Countries	**Period**	**N**	**Y**	**CPI**	**REER**
Group 1: Oil Rich Labor Importing States					
Kuwait	1975-2006	32	24.09	3.88	4.40
Oman	1972-2006	35	23.09	4.56	4.57
Saudi Arabia	1968-2006	39	25.59	4.35	4.74
Group 2: Oil Rich Labor Abundant States					
Algeria	1964-2006	43	24.30	2.75	5.07
Iran	1965-2006	42	24.94	1.97	5.29
Syria	1960-2006	47	22.88	2.81	4.94
Group 3: Oil Poor Labor Abundant NICs					
Egypt	1960-2006	47	24.45	2.79	4.42
Malta	1960-2006	47	21.07	4.04	4.75
Mauritania	1960-2006	47	20.37	3.36	4.97
Morocco	1960-2006	47	23.64	3.67	4.66
Pakistan	1967-2006	40	24.37	3.46	4.97
Turkey	1968-2006	39	25.49	-1.61	4.56
Group 4: Oil Poor Limited Natural Resource States					
Israel	1960-2006	47	24.61	-0.69	4.48
Jordan	1976-2006	31	22.53	4.14	4.64
Tunisia	1962-2006	45	22.94	3.68	4.81
Group 5: Natural Resource Poor States					
Sudan	1960-2006	47	22.58	-1.54	5.40
Oil	3.28				
World GDP	30.54				

Y, *CPI*, and REER denote real DDP, consumer price index, and real exchange rate, respectively. All variables are in logarithms.

Table 2: FEVD of Domestic Variables

Group 1: Oil Rich Labor Importing States

Kuwait

Proportions of FE in "GDP" accounted for by

Years	OIL	WGDP	GDP	REER	CPI
1	0.004	0.03	0.7	0.08	0.19
2	0.22	0.02	0.5	0.05	0.21
4	0.24	0.03	0.47	0.07	0.2
8	0.24	0.03	0.46	0.07	0.2
20	0.24	0.03	0.46	0.07	0.2

Proportions of FE in "REER" accounted for by

Years	OIL	WGDP	GDP	REER	CPI
1	0.1	0.04	0.04	0.8	0.02
2	0.11	0.06	0.04	0.76	0.02
4	0.12	0.06	0.04	0.76	0.02
8	0.12	0.06	0.04	0.76	0.02
20	0.12	0.06	0.04	0.76	0.02

Proportions of FE in "CPI" accounted for by

Years	OIL	WGDP	GDP	REER	CPI
1	0.005	0.06	0.15	0.55	0.25
2	0.03	0.06	0.13	0.56	0.22
4	0.05	0.06	0.13	0.54	0.22
8	0.05	0.06	0.13	0.54	0.22
20	0.05	0.06	0.13	0.54	0.22

Oman

Proportions of FE in "GDP" accounted for by

Years	OIL	WGDP	GDP	REER	CPI
1	0.12	0.07	0.73	0.07	0.002
2	0.23	0.17	0.55	0.05	0.01
4	0.27	0.16	0.51	0.05	0.01
8	0.28	0.16	0.51	0.05	0.01
20	0.28	0.16	0.51	0.05	0.01

Proportions of FE in "REER" accounted for by

Years	OIL	WGDP	GDP	REER	CPI
1	0.23	0.02	0.02	0.66	0.06
2	0.23	0.04	0.03	0.63	0.08
4	0.23	0.04	0.03	0.63	0.08
8	0.23	0.04	0.03	0.63	0.08
20	0.23	0.04	0.03	0.63	0.08

Proportions of FE in "CPI" accounted for by

Years	OIL	WGDP	GDP	REER	CPI
1	0.28	0.004	0.03	0.68	0.000001
2	0.3	0.02	0.03	0.61	0.04
4	0.3	0.03	0.03	0.59	0.05
8	0.3	0.03	0.03	0.59	0.05
20	0.3	0.03	0.03	0.59	0.05

SaudiArabia

	Proportions of FE in "GDP" accounted for by				
Years	OIL	WGDP	GDP	REER	CPI
1	0.09	0.05	0.81	0.03	0.02
2	0.16	0.18	0.61	0.04	0.01
4	0.16	0.22	0.57	0.04	0.01
8	0.16	0.23	0.56	0.04	0.01
20	0.16	0.23	0.56	0.04	0.01

	Proportions of FE in "REER" accounted for by				
Years	OIL	WGDP	GDP	REER	CPI
1	0.05	0.16	0.12	0.64	0.03
2	0.03	0.09	0.4	0.47	0.02
4	0.11	0.07	0.49	0.31	0.01
8	0.13	0.11	0.47	0.28	0.01
20	0.13	0.11	0.47	0.28	0.01

	Proportions of FE in "CPI" accounted for by				
Years	OIL	WGDP	GDP	REER	CPI
1	0.08	0.001	0.25	0.48	0.18
2	0.16	0.02	0.27	0.39	0.16
4	0.17	0.06	0.26	0.36	0.13
8	0.18	0.07	0.3	0.33	0.12
20	0.18	0.07	0.3	0.33	0.12

Group 2: Oil Rich Labor Abundant States

Algeria

	Proportions of FE in "GDP" accounted for by				
Years	OIL	WGDP	GDP	REER	CPI
1	0.08	0.1	0.78	0.03	0.01
2	0.08	0.09	0.75	0.06	0.02
4	0.07	0.1	0.74	0.06	0.02
8	0.07	0.1	0.74	0.06	0.02
20	0.07	0.1	0.74	0.06	0.02

	Proportions of FE in "REER" accounted for by				
Years	OIL	WGDP	GDP	REER	CPI
1	0.003	0.04	0.23	0.72	0.004
2	0.005	0.04	0.26	0.69	0.01
4	0.005	0.04	0.25	0.69	0.01
8	0.005	0.04	0.25	0.69	0.01
20	0.005	0.04	0.25	0.69	0.01

	Proportions of FE in "CPI" accounted for by				
Years	OIL	WGDP	GDP	REER	CPI
1	0.03	0.05	0.01	0.23	0.67
2	0.04	0.05	0.02	0.25	0.64
4	0.04	0.05	0.02	0.25	0.63
8	0.04	0.05	0.02	0.25	0.63
20	0.04	0.05	0.02	0.25	0.63

Iran

	Proportions of FE in "GDP" accounted for by				
Years	OIL	WGDP	GDP	REER	CPI
1	0.07	0.04	0.89	0.0008	0.004
2	0.05	0.05	0.9	0.0006	0.004
4	0.04	0.08	0.87	0.0006	0.003
8	0.04	0.09	0.86	0.0006	0.003
20	0.04	0.09	0.86	0.0006	0.003

	Proportions of FE in "REER" accounted for by				
Years	OIL	WGDP	GDP	REER	CPI
1	0.02	0.01	0.11	0.81	0.06
2	0.03	0.03	0.13	0.72	0.09
4	0.03	0.05	0.17	0.67	0.08
8	0.03	0.06	0.17	0.66	0.08
20	0.03	0.06	0.17	0.66	0.08

	Proportions of FE in "CPI" accounted for by				
Years	OIL	WGDP	GDP	REER	CPI
1	0.05	0.03	0.1	0.03	0.79
2	0.06	0.03	0.11	0.03	0.76
4	0.06	0.04	0.12	0.03	0.75
8	0.06	0.04	0.12	0.03	0.75
20	0.06	0.04	0.12	0.03	0.75

Syria

	Proportions of FE in "GDP" accounted for by				
Years	OIL	WGDP	GDP	REER	CPI
1	0.02	0.01	0.91	0.01	0.06
2	0.12	0.09	0.66	0.02	0.12
4	0.12	0.09	0.64	0.02	0.13
8	0.12	0.09	0.64	0.02	0.13
20	0.12	0.09	0.64	0.02	0.13

	Proportions of FE in "REER" accounted for by				
Years	OIL	WGDP	GDP	REER	CPI
1	0.02	0.0005	0.002	0.97	0.0008
2	0.02	0.002	0.01	0.96	0.004
4	0.02	0.004	0.01	0.95	0.01
8	0.02	0.004	0.01	0.95	0.01
20	0.02	0.004	0.01	0.95	0.01

	Proportions of FE in "CPI" accounted for by				
Years	OIL	WGDP	GDP	REER	CPI
1	0.01	0.0001	0.004	0.12	0.87
2	0.01	0.004	0.01	0.14	0.84
4	0.01	0.005	0.01	0.14	0.84
8	0.01	0.005	0.01	0.14	0.84
20	0.01	0.005	0.01	0.14	0.84

Group 3: Oil Poor Labor Abundant NICs

Egypt

	Proportions of FE in "GDP" accounted for by				
Years	OIL	WGDP	GDP	REER	CPI
1	0.05	0.0001	0.88	0.03	0.04
2	0.09	0.03	0.81	0.02	0.04
4	0.1	0.07	0.76	0.02	0.04
8	0.11	0.08	0.75	0.02	0.04
20	0.11	0.08	0.75	0.02	0.04

	Proportions of FE in "REER" accounted for by				
Years	OIL	WGDP	GDP	REER	CPI
1	0.16	0.03	0.01	0.8	0.0004
2	0.17	0.03	0.01	0.8	0.0008
4	0.16	0.03	0.01	0.79	0.0008
8	0.16	0.03	0.01	0.79	0.0008
20	0.16	0.03	0.01	0.79	0.0008

	Proportions of FE in "CPI" accounted for by				
Years	OIL	WGDP	GDP	REER	CPI
1	0.001	0.01	0.002	0.001	0.99
2	0.05	0.03	0.02	0.02	0.88
4	0.05	0.03	0.03	0.02	0.88
8	0.05	0.03	0.03	0.02	0.88
20	0.05	0.03	0.03	0.02	0.88

Malta

	Proportions of FE in "GDP" accounted for by				
Years	OIL	WGDP	GDP	REER	CPI
1	0.04	0.09	0.86	0.01	0.001
2	0.17	0.07	0.75	0.01	0.001
4	0.18	0.13	0.68	0.01	0.001
8	0.18	0.16	0.66	0.01	0.001
20	0.18	0.16	0.65	0.01	0.001

	Proportions of FE in "REER" accounted for by				
Years	OIL	WGDP	GDP	REER	CPI
1	0.05	0.00004	0.08	0.87	0.00001
2	0.12	0.16	0.08	0.64	0.00001
4	0.12	0.16	0.09	0.63	0.00002
8	0.12	0.16	0.09	0.63	0.00002
20	0.12	0.16	0.09	0.63	0.00002

	Proportions of FE in "CPI" accounted for by				
Years	OIL	WGDP	GDP	REER	CPI
1	0.001	0.01	0.002	0.01	0.98
2	0.19	0.05	0.002	0.08	0.67
4	0.22	0.13	0.002	0.07	0.57
8	0.22	0.13	0.002	0.07	0.57
20	0.22	0.13	0.002	0.07	0.57

Mauritania

	Proportions of FE in "GDP" accounted for by				
Years	OIL	WGDP	GDP	REER	CPI
1	0.02	0.004	0.93	0.03	0.02
2	0.02	0.07	0.8	0.06	0.04
4	0.02	0.08	0.79	0.06	0.04
8	0.02	0.08	0.79	0.06	0.04
20	0.02	0.08	0.79	0.06	0.04

	Proportions of FE in "REER" accounted for by				
Years	OIL	WGDP	GDP	REER	CPI
1	0.001	0.03	0.01	0.94	0.02
2	0.01	0.04	0.01	0.91	0.04
4	0.01	0.04	0.01	0.91	0.04
8	0.01	0.04	0.01	0.91	0.04
20	0.01	0.04	0.01	0.91	0.04

	Proportions of FE in "CPI" accounted for by				
Years	OIL	WGDP	GDP	REER	CPI
1	0.03	0.000004	0.00001	0.36	0.61
2	0.03	0.000005	0.00002	0.38	0.59
4	0.03	0.003	0.000	0.38	0.59
8	0.03	0.003	0.000	0.38	0.59
20	0.03	0.003	0.000	0.38	0.59

Morocco

	Proportions of FE in "GDP" accounted for by				
Years	OIL	WGDP	GDP	REER	CPI
1	0.001	0.03	0.93	0.03	0.001
2	0.05	0.03	0.86	0.06	0.001
4	0.05	0.04	0.84	0.06	0.001
8	0.05	0.04	0.84	0.06	0.001
20	0.05	0.04	0.84	0.06	0.001

	Proportions of FE in "REER" accounted for by				
Years	OIL	WGDP	GDP	REER	CPI
1	0.005	0.16	0.02	0.76	0.05
2	0.003	0.12	0.04	0.73	0.1
4	0.003	0.14	0.04	0.72	0.1
8	0.004	0.14	0.04	0.71	0.1
20	0.004	0.14	0.04	0.71	0.1

	Proportions of FE in "CPI" accounted for by				
Years	OIL	WGDP	GDP	REER	CPI
1	0.08	0.21	0.01	0.12	0.58
2	0.06	0.25	0.01	0.2	0.48
4	0.06	0.25	0.01	0.2	0.48
8	0.06	0.25	0.01	0.2	0.48
20	0.06	0.25	0.01	0.2	0.48

Pakistan

	Proportions of FE in "GDP" accounted for by				
Years	OIL	WGDP	GDP	REER	CPI
1	0.01	0.01	0.97	0.002	0.01
2	0.01	0.01	0.97	0.003	0.01
4	0.01	0.01	0.97	0.004	0.01
8	0.01	0.01	0.96	0.004	0.01
20	0.01	0.01	0.96	0.004	0.01

	Proportions of FE in "REER" accounted for by				
Years	OIL	WGDP	GDP	REER	CPI
1	0.01	0.15	0.02	0.8	0.02
2	0.04	0.18	0.13	0.63	0.02
4	0.05	0.18	0.13	0.61	0.02
8	0.05	0.18	0.13	0.61	0.02
20	0.05	0.18	0.13	0.61	0.02

	Proportions of FE in "CPI" accounted for by				
Years	OIL	WGDP	GDP	REER	CPI
1	0.01	0.01	0.01	0.05	0.92
2	0.09	0.05	0.01	0.23	0.63
4	0.07	0.19	0.05	0.24	0.46
8	0.06	0.2	0.06	0.24	0.44
20	0.06	0.2	0.06	0.24	0.44

Turkey

	Proportions of FE in "GDP" accounted for by				
Years	OIL	WGDP	GDP	REER	CPI
1	0.07	0.04	0.85	0.02	0.02
2	0.07	0.05	0.79	0.03	0.06
4	0.07	0.06	0.78	0.03	0.06
8	0.07	0.06	0.78	0.03	0.06
20	0.07	0.06	0.78	0.03	0.06

	Proportions of FE in "REER" accounted for by				
Years	OIL	WGDP	GDP	REER	CPI
1	0.004	0.01	0.19	0.79	0.01
2	0.02	0.03	0.19	0.74	0.02
4	0.03	0.03	0.19	0.74	0.02
8	0.03	0.03	0.19	0.74	0.02
20	0.03	0.03	0.19	0.74	0.02

	Proportions of FE in "CPI" accounted for by				
Years	OIL	WGDP	GDP	REER	CPI
1	0.0001	0.04	0.21	0.01	0.74
2	0.07	0.04	0.23	0.02	0.65
4	0.07	0.06	0.22	0.02	0.64
8	0.07	0.06	0.22	0.02	0.64
20	0.07	0.06	0.22	0.02	0.64

Group 4: Oil Poor Limited Natural Resource States

Israel

Proportions of FE in "GDP" accounted for by

Years	OIL	WGDP	GDP	REER	CPI
1	0.02	0.01	0.87	0.09	0.01
2	0.02	0.04	0.84	0.1	0.01
4	0.02	0.12	0.75	0.1	0.01
8	0.02	0.12	0.75	0.1	0.01
20	0.02	0.12	0.75	0.1	0.01

Proportions of FE in "REER" accounted for by

Years	OIL	WGDP	GDP	REER	CPI
1	0.06	0.00003	0.17	0.78	0.0003
2	0.05	0.06	0.22	0.67	0.003
4	0.05	0.06	0.24	0.64	0.003
8	0.05	0.06	0.24	0.64	0.003
20	0.05	0.06	0.24	0.64	0.003

Proportions of FE in "CPI" accounted for by

Years	OIL	WGDP	GDP	REER	CPI
1	0.2	0.01	0.01	0.08	0.71
2	0.2	0.01	0.01	0.08	0.7
4	0.2	0.01	0.03	0.07	0.69
8	0.2	0.01	0.03	0.07	0.69
20	0.2	0.01	0.03	0.07	0.69

Jordan

Proportions of FE in "GDP" accounted for by

Years	OIL	WGDP	GDP	REER	CPI
1	0.0001	0.01	0.71	0.01	0.27
2	0.03	0.08	0.59	0.1	0.2
4	0.04	0.08	0.57	0.1	0.21
8	0.04	0.09	0.56	0.1	0.21
20	0.04	0.09	0.56	0.1	0.21

Proportions of FE in "REER" accounted for by

Years	OIL	WGDP	GDP	REER	CPI
1	0.11	0.0004	0.35	0.52	0.01
2	0.1	0.02	0.34	0.53	0.02
4	0.1	0.02	0.33	0.53	0.02
8	0.1	0.02	0.33	0.53	0.02
20	0.1	0.02	0.33	0.53	0.02

Proportions of FE in "CPI" accounted for by

Years	OIL	WGDP	GDP	REER	CPI
1	0.08	0.0004	0.02	0.26	0.64
2	0.08	0.12	0.03	0.37	0.4
4	0.09	0.18	0.03	0.37	0.33
8	0.09	0.2	0.03	0.37	0.32
20	0.09	0.2	0.03	0.37	0.32

Tunisia

	Proportions of FE in "GDP" accounted for by				
Years	OIL	WGDP	GDP	REER	CPI
1	0.19	0.04	0.68	0.06	0.02
2	0.17	0.09	0.59	0.09	0.06
4	0.17	0.11	0.56	0.08	0.07
8	0.17	0.11	0.56	0.08	0.07
20	0.17	0.11	0.56	0.08	0.07

	Proportions of FE in "REER" accounted for by				
Years	OIL	WGDP	GDP	REER	CPI
1	0.002	0.01	0.14	0.85	0.004
2	0.14	0.06	0.15	0.65	0.004
4	0.17	0.06	0.14	0.62	0.004
8	0.17	0.06	0.14	0.62	0.004
20	0.17	0.06	0.14	0.62	0.004

	Proportions of FE in "CPI" accounted for by				
Years	OIL	WGDP	GDP	REER	CPI
1	0.01	0.49	0.004	0.01	0.48
2	0.03	0.59	0.01	0.01	0.37
4	0.03	0.58	0.01	0.01	0.37
8	0.03	0.58	0.01	0.01	0.37
20	0.03	0.58	0.01	0.01	0.37

Group 5: Natural Resource Poor States

Sudan

	Proportions of FE in "GDP" accounted for by				
Years	OIL	WGDP	GDP	REER	CPI
1	0.00002	0.14	0.86	0.001	0.0005
2	0.002	0.19	0.8	0.002	0.001
4	0.004	0.21	0.78	0.002	0.001
8	0.004	0.22	0.78	0.002	0.002
20	0.004	0.22	0.78	0.002	0.002

	Proportions of FE in "REER" accounted for by				
Years	OIL	WGDP	GDP	REER	CPI
1	0.03	0.001	0.01	0.88	0.07
2	0.03	0.002	0.01	0.81	0.15
4	0.03	0.003	0.01	0.8	0.15
8	0.03	0.003	0.01	0.8	0.15
20	0.03	0.003	0.01	0.8	0.15

	Proportions of FE in "CPI" accounted for by				
Years	OIL	WGDP	GDP	REER	CPI
1	0.02	0.00009	0.09	0.00001	0.89
2	0.01	0.002	0.07	0.13	0.78
4	0.01	0.01	0.07	0.13	0.77
8	0.01	0.01	0.07	0.13	0.77
20	0.01	0.01	0.07	0.13	0.77

Figure 1

Group 1: Oil Rich Labor Importing States

a. One standard deviation shock in ε_t^{mf} | **b. One standard deviation shock in ε_t^{yf}** | **c. One standard deviation shock in ε_t^{y}** | **d. One standard deviation shock in ε_t^{q}** | **e. One standard deviation shock in ε_t^{p}**

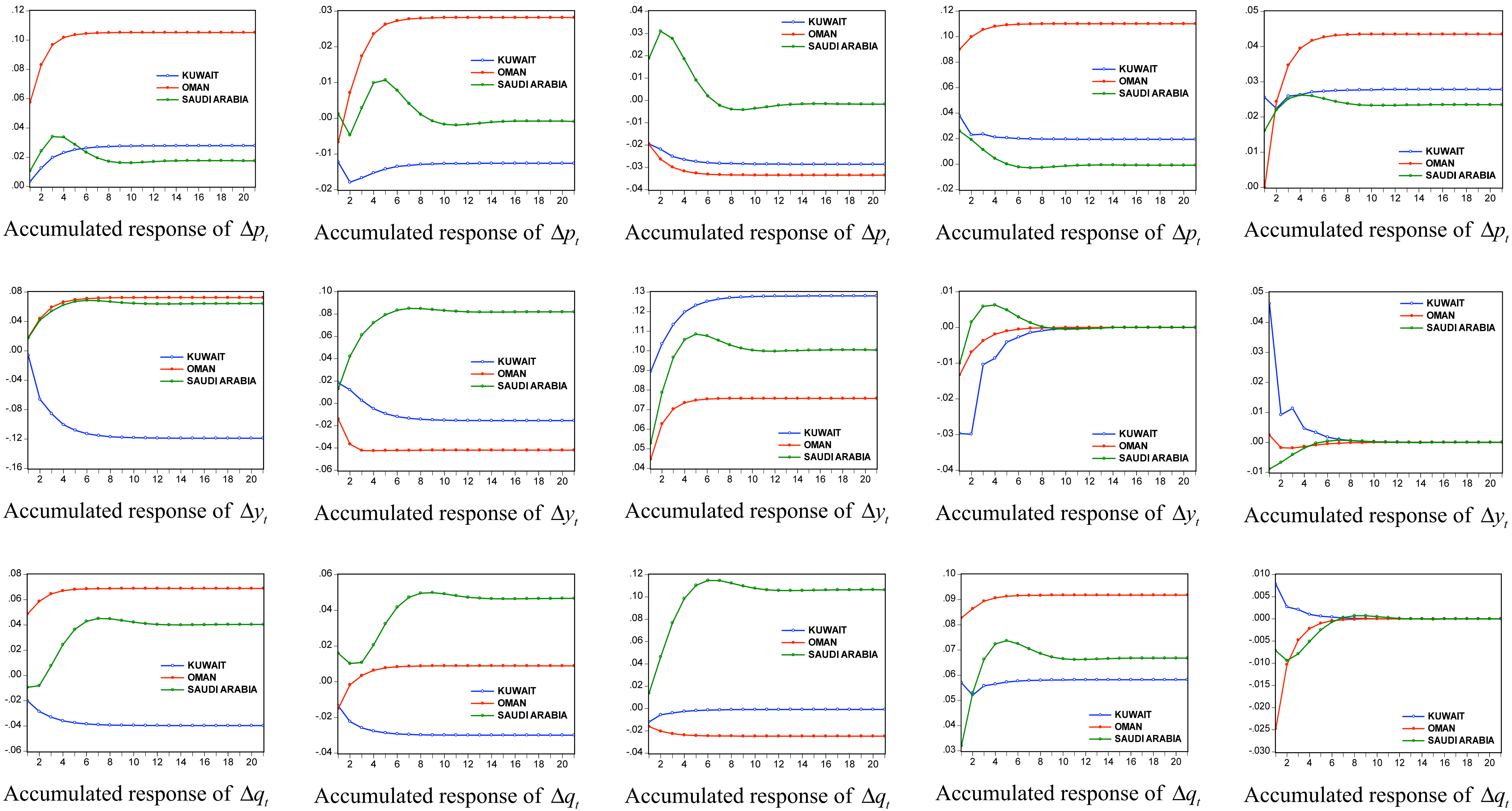


Figure 2

Group 2: Oil Rich Labor Abundant States

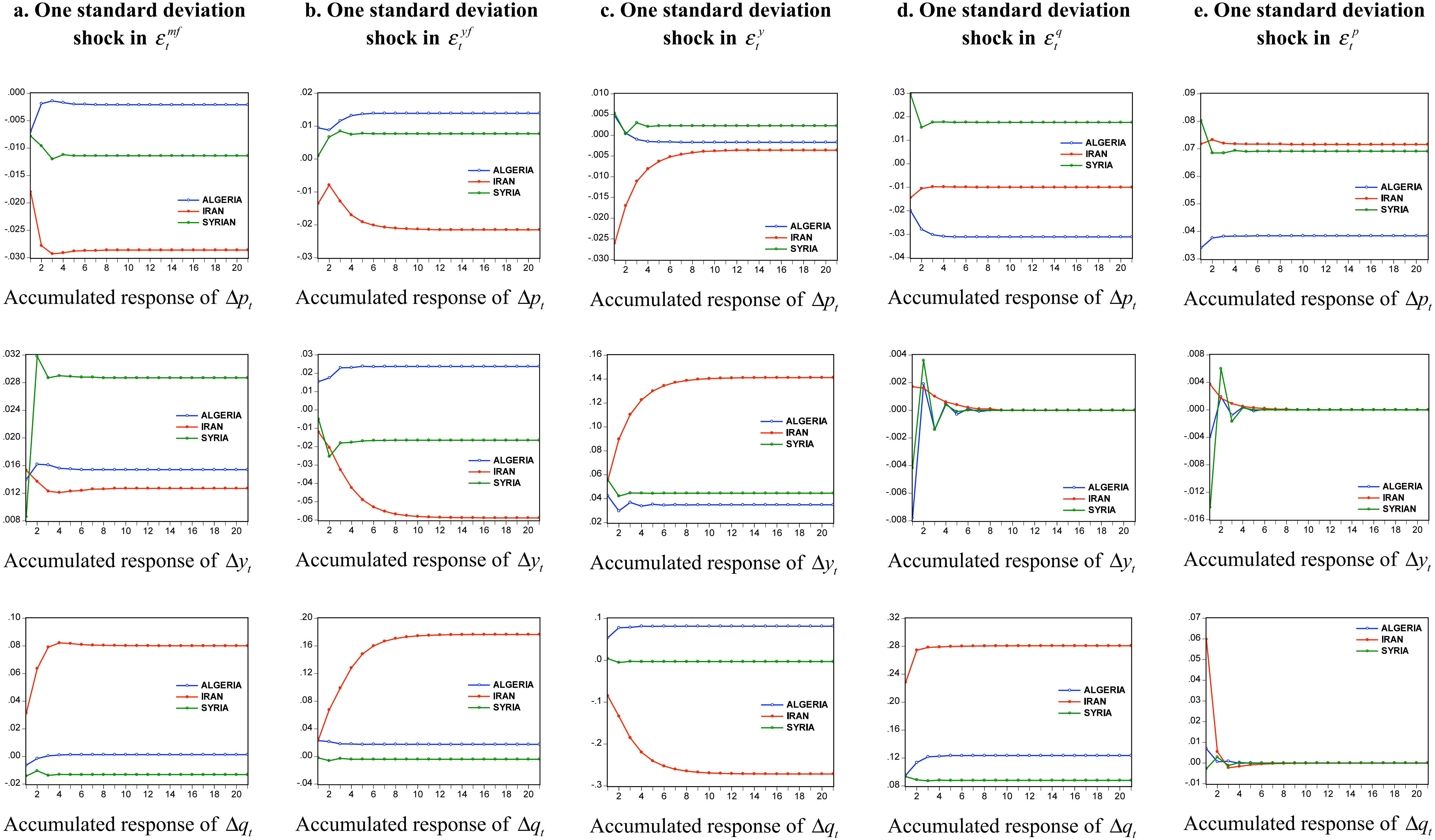


Figure 3

Group 3: Oil Poor Labor Abundant NICs

a. One standard deviation shock in ε_t^{mf} | **b. One standard deviation shock in ε_t^{yf}** | **c. One standard deviation shock in ε_t^{y}** | **d. One standard deviation shock in ε_t^{q}** | **e. One standard deviation shock in ε_t^{p}**

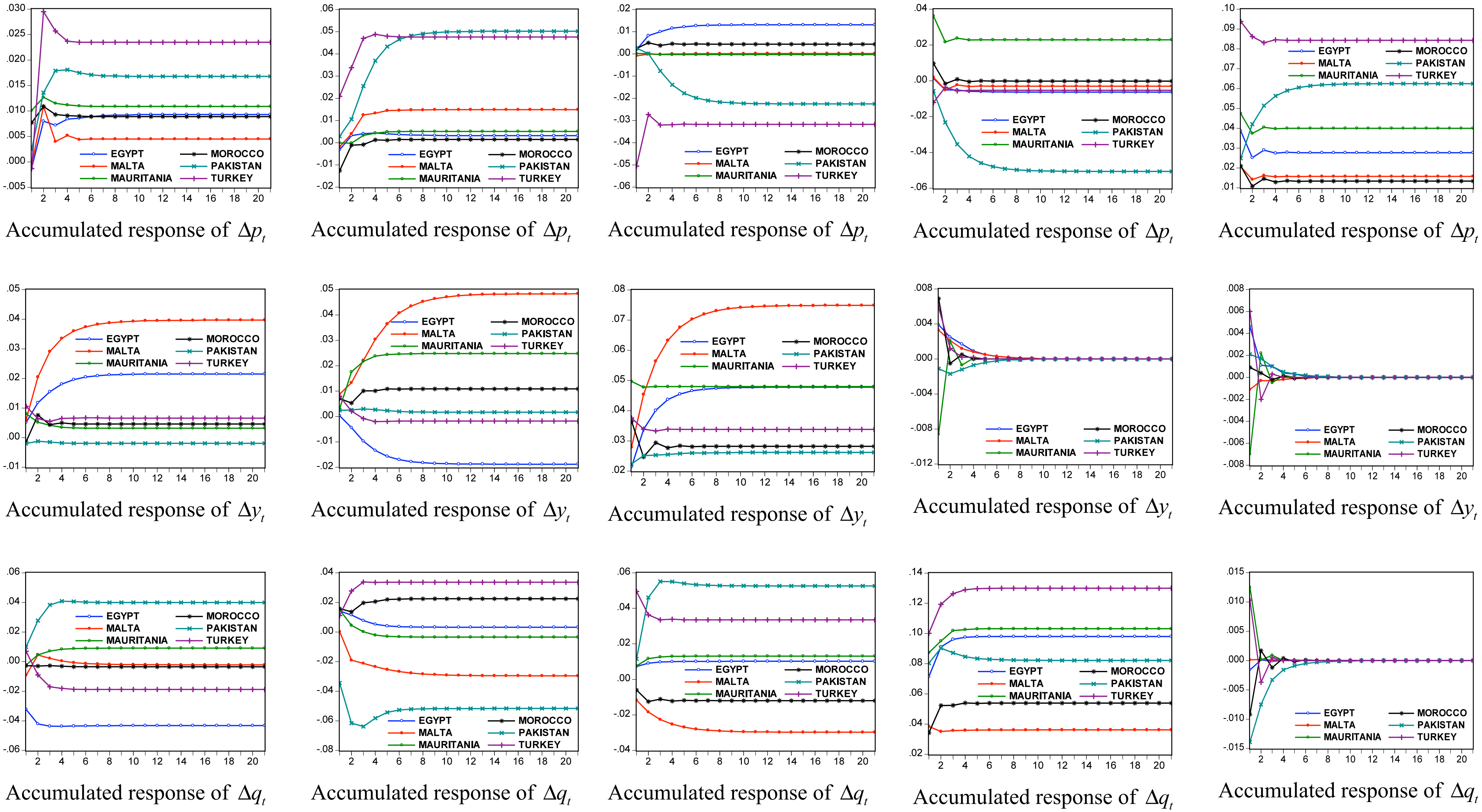
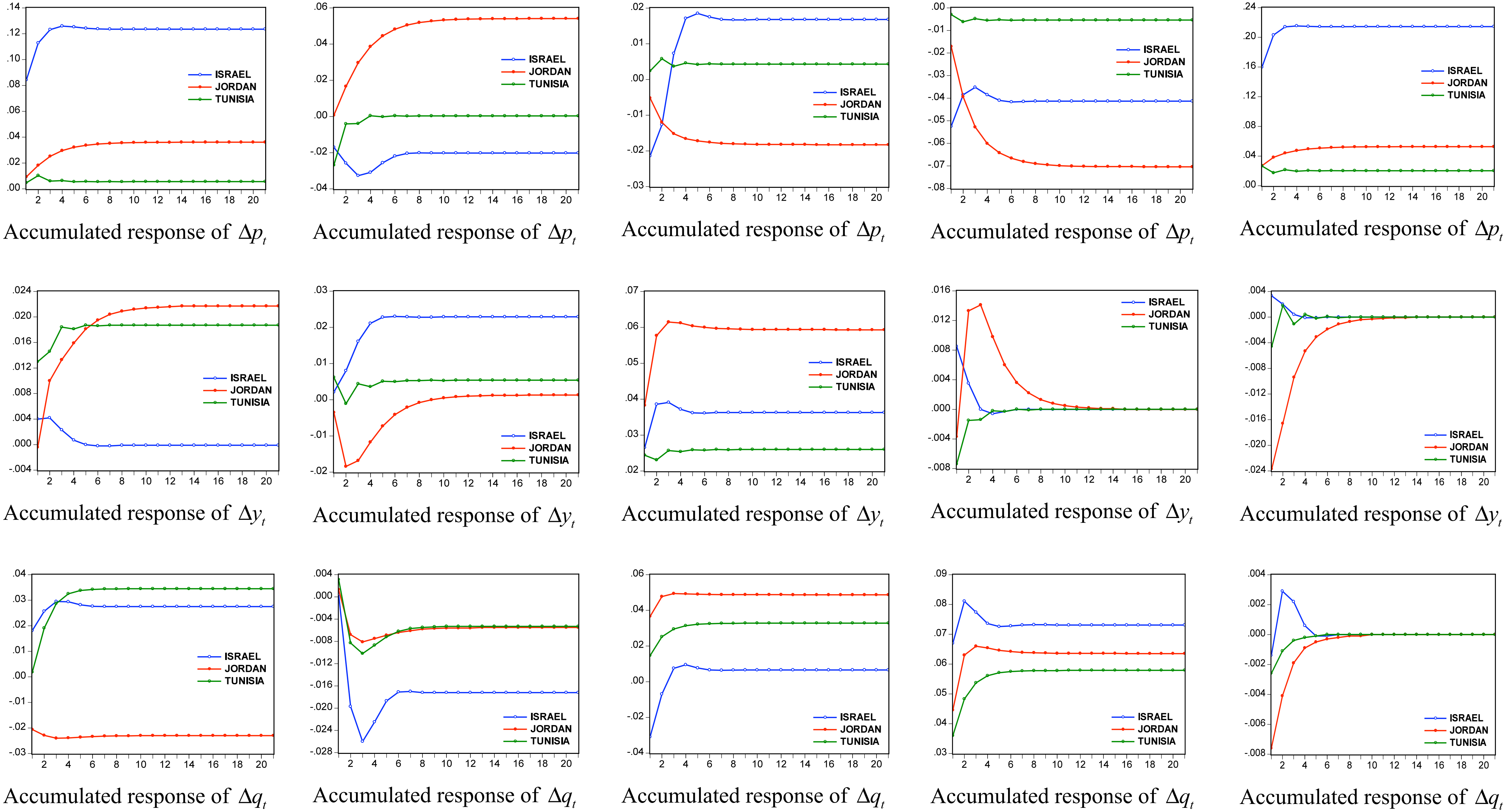


Figure 4

Group 4: Oil Poor Limited Natural Resource States

a. One standard deviation shock in ε_t^{mf} | **b. One standard deviation shock in ε_t^{yf}** | **c. One standard deviation shock in ε_t^{y}** | **d. One standard deviation shock in ε_t^{q}** | **e. One standard deviation shock in ε_t^{p}**



Accumulated response of Δp_t (a–e)

Accumulated response of Δy_t (a–e)

Accumulated response of Δq_t (a–e)

Figure 5

Group 5: Natural Resource Poor States (Sudan)

a. One standard deviation shock in ε_t^{mf}

b. One standard deviation shock in ε_t^{yf}

c. One standard deviation shock in ε_t^{y}

d. One standard deviation shock in ε_t^{q}

e. One standard deviation shock in ε_t^{p}