The impact of exchange rate shocks on trade in times of uncertainties: evidence from three oil-importing countries in the MENA region

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In this paper, a VAR methodology is run on monthly data from 2000 to 2017 in order to investigate the impact of the real exchange rate on trade flows of three oil-importing countries in the MENA region, especially during the tremendous and transitional post-Arab Spring period. Impulse response functions and variance decomposition analyses highlight a weak effectiveness of the exchange rate policies of these countries, notably the expanding currency flexibility process of the transition period, in enhancing their exports and containing their trade deficit balances. The improvements in trade performances are more related to important ameliorations of non-price competitiveness of the products rather than solely on currency devaluation. The results show also a strong dependence and attachment of the imports of these countries to the variations of their exports. This dependence explains to a certain extent the failure of the devaluation policies in alleviating the widening trade deficits during the post Arab Spring times of uncertainties.

Introduction

In January 2011, a popular uprising broke out in Tunisia and ended up by ousting the then country's president Ben Ali who ruled the country with a rod of iron for more than twenty-three years. This event has escalated and spread as a ripple effect in several other countries in the Middle East & North Africa (MENA) region, such as Egypt, Morocco, Libya, Syria and Yemen which, likewise, experienced popular unrests and political instability that are continuing up to this time. This process that was coined by some observers as the *Arab Spring* has, in an environment of considerable uncertainties, put several MENA countries in a track of transition toward not only more democracy and freedom but also to new economic and social schemes. Recall that the principal trigger of the uprisings was economic; namely youth unemployment.

For the time being, it is however too early to say that the economies of these countries are back to their normal; rather they are still passing through a transition stage with all its uncertainties and risks. In fact, since 2011, the inflation rate has soared in Tunisia (from 3.24 percent in 2011 to 7.3 percent in 2018) and Egypt (from 10 percent in 2011 to 29.5 percent in 2017).[1] In the same year 2011, the real economy has also incurred severe shocks in Tunisia, Egypt and to a lesser extent Morocco, and whose negative effects are still occurring at the time of writing this paper; in fact, throughout the post-Arab Spring period the real GDP growth rates in these countries are lower than those recorded in the course of the earlier period. During the aftermath of the Arab Spring, these three countries have been experiencing remarkable deteriorations of their trade balances (figure 1). In the same time, the exchange rates of their national currencies have experienced huge depreciations with respect to the main trade partners'

[1] *IMF, International Financial Statistics.*

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currencies; in fact during the post-Arab Spring period the real effective exchange rate of Tunisia, Egypt and Morocco incurred significant depreciations reaching sometimes 15.4, 34 and 4 percentage points, respectively (the base year is 2010).[2] The increasing pressures on their foreign currency reserves, in addition to the underlying requests of the IMF financial assistance programs, have forced Tunisia, Egypt and, to a lesser extent, Morocco to introduce more flexibility to their exchange rate setting.

The purpose of this paper is to provide evidence on the extent to which the exchange rate policy in three oil-importing countries in the MENA region (I will refer to as the OICs) has affected their foreign trade with a focus on the uncertain and risky post Arab Spring periods. The three selected countries are: Tunisia, Egypt, and Morocco. Unlike other MENA countries, these countries' economies are relatively diversified and have experienced all the uncertainties of the Arab Spring episode.

I will compare between two periods; namely the more stable pre-Arab Spring period (I will refer to this period as the normal period[3]) and the more troubled and confusing post- Arab Spring period (I will refer to this period as the transition period[4])

The rest of the paper is organized as follows. Section 1 presents a literature review. Section 2 exhibits a brief review of the exchange rate policy frameworks in the sample countries. Section 3 presents the model and the empirical methodology. Section 4 describes the data. Then section 5 presents the results of the empirical analysis and then I conclude.

Literature review

Since the breakdown of the Bretton-Woods agreement and the gradual adoption by many world major trading nations of floating exchange rate regimes, the economic theory has started to examine the relationship between the exchange rate, on the one hand, and trade on the other hand. Economists agree that the uncertainties related to this change in the exchange rate determination can affect trade between nations; indeed, the impact of the exchange rate on the economic activity, in general, and trade remains to this date a subject of debate. The traditional economic theory as represented by the Mundell-Fleming model argues that a depreciation of the local currency stimulates the economy. A large part of the literature has focused on the impact of the exchange rate volatility on trade flows; namely exports and imports. Early studies suggested that unexpected changes in exchange rates could reduce trade flows (Artus, 1983 and Brodsky, 1984). However, Taglioni (2012) pointed out that since the mid-2000s researchers started to study the relationship between the level of the exchange rate (misalignment) and trade. The economic theory suggests that when markets are free of distortions, the level of the exchange rate has no effect on trade in the long run but in the short run, and because of the price stickiness, movements in the exchange rate can affect the international trade flows. However, the empirical literature is not decisive about the nature of this relationship. As argued in many empirical papers, notably Auboin and Ruta (2011), and WTO (2011), the relationship between these two variables is multi-faceted, complex and not definitive. Taglioni (2012) argues that even when prices are sticky and the necessary market conditions hold, the effect of a change in the level of the exchange rate on trade flows stays ambiguous in sign, statistical significance and intensity. Taglioni points out that the reason of this indeterminacy is attributed to the characteristics of the economy, in general, and the individual firms operating in it. The same author explains this indeterminacy by the following two opposite effects: on the one hand, an appreciation of the domestic currency tends to reduce the sales and the profit margins of the exporter due to a loss in competitiveness. On the other hand, such an appreciation of the exchange rate triggers pro-competitive effects by reallocating resources toward the most dynamic and creative domestic producers. Those are quicker to adapt to the new challenges by implementing new strategies and introducing the best practices techniques to put in place faster product cycles and improve product quality.

Based on micro French data covering the period (1995-2005) Berman and *al.* (2012) argue that high-performance firms react to a depreciation by increasing significantly their markup and by increasing less their export volume. This heterogeneous pricing-to-market may partly explain the weak impact of exchange rate movements on aggregate exports. According to Rodrik (2008), a sustained real depreciation of the currency has a positive impact on growth in developing countries since it increases the relative profitability of investing in tradable goods and alleviates the institutional and market failures distortions in these economies. Nevertheless, on the empirical side, this positive effect is still a subject of controversy in developing and emerging economies. The huge economic contraction in Latin American economies in the aftermath of a process of currency devaluation has led to more examination of the negative effects of this policy in developing and emerging economies. The low demand elasticities of the exports and imports can explain the weak effectiveness of currency devaluation on trade (Edwards, 1986). Nonetheless, since the 1950s the IMF stabilization programs still require developing

[2] *IMF, International Financial Statistics.*

[3] *The expressions normal period and pre-Arab Spring period will be used interchangeably in this text.*

[4] *The expressions transition period and post-Arab Spring period will be used interchangeably in this text.*

countries to devalue their currencies in order to stabilize their trade balances (Hutchison, 2003).

Using a dataset of 100 countries through a period between 2000 and 2009, Nicita (2013) study shows the importance of exchange rate misalignment (level) in a country's trade performance while disregarding that of exchange rate volatility. Based on a large countries' dataset Clark and *al*. (2004) doesn't find robust results confirming that the volatility of the exchange rate can hurt international trade even for developing countries.

Nabli and Veganzones-Varoudakis (2004) show that the MENA countries' exports have been seriously affected by the overvaluation of their currencies despite the exchange rate policy reforms of the 1990s. They point out that the countries with more diversified economies and exports benefited more from the above-mentioned reforms-by-devaluation than the others. Rey (2006), based on quarterly data between 1970 and 2002, finds that for Tunisia and Egypt there is a negative relationship between the exchange rate volatility and their exports to the European Union. On the other hand, this relationship becomes positive for Morocco. Based on monthly data from 2000 to 2011 Sabri and *al*. (2012) use a VAR model with exogenous variables to study the impact of exchange rate volatility on trade between three MENA countries (namely Egypt, Morocco and Jordan) and the EU. They show that the effect on trade of an appreciation of the national currencies is quite high.

Achy and Sekkat (2003) study the effect of exchange rate policy on the exports of 11 sectors over the period 1970-1997 in a sample of countries that include Tunisia, Egypt and Morocco. They find that the exchange rate management plays a crucial role in providing incentives for manufactured exports toward Europe. They suggest also that policymakers should be more concerned with misalignment than with volatility. Using a large sample of countries including several MENA countries over the period 1980-2002, Lahrèche-Révil and Milgram (2006) find that the exchange rate volatility has no or a positive impact on the exports of the MENA countries over the following periods (1980-2002 and 1992-2002). However, the region's imports are much more sensitive to exchange rate volatility over the entire period of study. Kandil and Dincer (2008) use a sample from 1980 to 2005 to study the impact of changes in the exchange rate on output in Egypt and Turkey. They show that an unanticipated depreciation has more pervasive impact than an unanticipated appreciation in Egypt because exports appear to be more inelastic to currency changes while import prices are highly affected. Shokry and Bouaddi (2018) use a sectorial sample from 1982 to 2014 and investigate the impact of changes in the exchange rate on sectoral GDP in Egypt and find that in highly exporting sectors the effect of a devaluation in the real exchange rate is positive.

Gaysset and *al.* (2019) use data from 1977 to 2016 and show that a fiscal consolidation in the EMU countries negatively affects the GDP growth rates and the current accounts in MENA countries.

Unlike most related literature that focused mainly on the effects of the exchange rate volatility on the region's commerce, this research, using a VAR methodology, will investigate rather the impact of the level of the exchange rate on trade in three OICs in MENA region employing the real effective exchange rate instead of the bilateral rate to reflect better the competitiveness of these countries in foreign markets. To the best of my knowledge, this paper is the first to try to assess the effectiveness of the exchange rate policies implemented in some OICs in MENA region during the unstable, full of pressure and uncertain post-Arab Spring period.

Exchange rate policy frameworks

Tunisia

Tunisia had pegged the dinar to a basket of currencies until 1994. Between 1992 and 2000 it targeted the real exchange rate in order to protect its competitiveness in foreign markets (Dropsy and Grand, 2004). Though the *de jure* exchange rate regime is a managed float, the IMF has classified Tunisia's *de facto* exchange rate regime differently across time; between 2010 and 2012 the IMF classified it as stabilized arrangement, between 2012 and 2016 as a crawl-like arrangement and since 2017 the classification shifted Tunisia to the floating arrangement (IMF, 2016 and 2017).

Egypt

In January 2001, the Central Bank of Egypt (the CBE) announced the adoption of a *de jure* crawling peg exchange rate regime that was followed by several devaluations of the Egyptian pound. In January 2003 the CBE adopted a new *de jure* floating exchange rate regime. However, the IMF has reclassified the *de facto* exchange rate regime of Egypt several times in the last few years. In fact, until 2012 the IMF has classified the Egyptian regime as crawl-like arrangement, from 2012 to 2016 as stabilized arrangement, from 2016 to 2017 as other managed arrangement. Since 2017 the IMF reclassified Egypt to floating arrangement (IMF, 2016 and 2017).

Morocco

Morocco adopts a fixed intermediate exchange rate regime, in which the national currency is pegged to a basket of currencies that reflects the structure of Morocco's foreign trade. The purpose of the quotation basket is to ensure the stability of the dirham in terms of the nominal effective exchange rate and to mitigate the impact of fluctuations in major currencies on the Moroccan dirham. In April 2001, the basket was restructured to include only the euro and the U.S. dollar with respective weights of 80 percent and 20 percent. This measure aimed to further reduce fluctuations of

the dirham against the currency of Morocco's main trading partners. In April 2015, and in order to facilitate the transition to a more flexible exchange rate regime the weights of both currencies in the quotation basket were revised; the new weights were then set at 60 percent for the euro and 40 percent for the U.S. dollar.[5] The IMF classifies the *de facto* Moroccan foreign exchange regime as conventional exchange rate peg regime (IMF, 2016 and 2017).

Model and empirical methodology

Since the seminal work of Sims (1980 and 1992), Vector Autoregressive (VAR) models have been broadly employed by many researchers to address the relationship between monetary and exchange rate policies and macroeconomic variables. Though VAR models are a-theoretical in the sense that their structure does not depend on precise economic relationships, they are very useful for the analysis of the historical data dynamics in any given economy. VAR methodology is very suitable for data analysis because it comes with several useful tools such as the impulse response functions and the variance decomposition that are very convenient in studying the effects of economic shocks and their magnitudes in specific historical periods.

As emphasized by Bini-Smaghi (1991) VAR methodology has two important advantages over other times series frameworks. First, it can present dynamic relationship between variables. Second, it does not impose explicit theoretical restrictions on the system variables.

The structural VAR model can be written as follows

$$Y_t = A(L)Y_{t-1} + B(L)X_t + \xi_t \qquad (1)$$

Where:

A(L) and B(L) are the matrix lag polynomials.

Y is the vector of endogenous variables.

X is the vector of exogenous variables.

ξ is the residuals vector.

t is a subscript indexing time.

The structural VAR model (1) can be rewritten as follows: $Y_t = C(L)e_t$

Where:

C(L) is the matrix lag polynomial.

e_t is the vector of the underlying structural shocks. I assume that these individual shocks are orthogonal; i.e., that their variance covariance $V(e_t)$ is diagonal.

I select for this model the following endogenous variables: the values of exports, *ex*, imports, *im*, the industrial production index, *ind*, the consumer price index, *p*, the short-term interest rate, *r*, and the real effective exchange rate, *reer*.

$$Y'_t = [ex_t, im_t, ind_t, p_t, r_t, reer_t]$$

The real effective exchange rate is chosen over the bilateral exchange rate since it has more explanatory powers as it is by nature calculated in a way to be more comprehensive and more representative of the value of the national currencies and all the currencies of the trade partners of the selected sample countries.

The ordering of the endogenous variables is important in this VAR methodology. Kim and Roubini (2008) point out that a country's trade is determined by economic cycles. In fact, in times of recessions trade balance improves due to a lower demand for imports. The implicit assumptions related to the variable ordering in the model above are the following. First, the exports and the imports do not respond simultaneously to the economic activity, as represented by the industrial production index, the consumer price index and the short run interest rate. Second, the *reer* variable is put last in the ordering since exchange rate shocks are assumed to not influence the exports, the imports, the industrial production and the interest rate instantaneously.

On the other hand, following several empirical studies such as Gaysset and *al.* (2019) the endogenous variables in the model are completed by a vector X_t of exogenous variables. These variables are added on the basis of the standard economic theory. Based on Chailloux and *al.* (2009), and in order to control for the economic dynamics of the global and the E.U. economies (the main trade partner of my sample-countries) the vector X_t includes: the commodity price, oil, the European Union's industrial production index, ind^{eur}, and the current and lagged short-term interest rates in the E.U., r^{eur}.

$$X'_t = [oil_t, ind^{eur}_t, r^{eur}_t, r^{eur}_{t-1}]$$

As suggested by Gaysset and *al.* (2019) I control for the events of the Arab Spring that broke out in December 2010 and have tremendously affected Tunisia, Egypt and to a lesser degree Morocco. For this purpose, I test for structural breaks in the data that have most likely occurred after this date and divide accordingly the sample period into two sub-periods.

Data

The data I use in the analysis are of a monthly frequency. Each country's U.S. dollars values of exports[6] and imports,[7] real effective exchange rate, consumer price index (CPI), domestic industrial production index, and the euro area's industrial production index data come from the IMF IFS database. Interest rate data come from various sources. For

[5] *Source : http://www.bkam.ma/en/Monetary-policy/Strategic-framework/Presentation*

[6] *Exports F.O.B.*

[7] *Imports C.I.F.*

Egypt, Overnight Interbank Interest Rate from DataStream is used. Morocco's money market rate is taken from the IMF IFS database. For Tunisia, the money market rate (TMM) comes from the Central Bank of Tunisia. The euro area's short-term interest rate data come from the European Central Bank's statistics. The oil prices per barrel are collected from FRED Economic Data.[8]

The data was expressed in natural logarithms and seasonally adjusted except for both domestic and foreign short-term interest rates, which were expressed solely in terms of levels and not seasonally adjusted.[9]

Sample periods depend on data availability and begin in January 2007 for Egypt and in January 2000 for Tunisia and Morocco. Samples end in September 2015 for Egypt and in December 2017 for Tunisia and Morocco.

As mentioned earlier and in order to investigate how uncertainty has influenced the relationship between trade and the exchange rate, a Chow test of structural break at an unknown break point is run on each country's data in order to determine the date of a structural break. This test reveals structural break points in the datasets in the aftermath of the Arab Spring outbreak in December 2010; namely, August 2011, November 2011 and March 2012 in the datasets of Tunisia, Egypt and Morocco, respectively. Hence, the sample period of each country is divided into two sub-periods; namely the more stable pre-Arab Spring period (the normal period) and the more uncertain and volatile post-Arab Spring period (the transition period).

By comparing the two sub-periods I can assess the impact of the growing uncertainty in the OICs on the relationship between their trade and the exchange rate. As mentioned earlier, during the transition period, each country has experienced a profound depreciation of its national currency with respect to the major foreign currencies; i.e., the U.S. dollar and the euro and the trade balances have incurred expanding deficits (see figure 1).

Results

Lag selection and Granger causality analysis

The optimal lag lengths for each series in the VAR models have been chosen in accordance with the Akaike and Schwartz Information Criteria (AIC), which suggested a two-lag VAR (2) for Tunisia, a one-lag VAR (1) for Egypt and a five lag VAR (5) for Morocco.[10]

Based on the entire period samples, tables 1, 2 and 3 show for each country the Granger causality tests between the selected endogenous variables. I find that the level of the real effective exchange rate Granger causes the exports and the imports in Tunisia. The Egyptian data, however, show that the exports and the imports Granger cause the real exchange rate. The Moroccan data indicate that the imports Granger cause the exchange rate but no evidence of a direct Granger causality between the exports and the exchange rate.

Another interesting finding is revealed by these tables, that is: in all sample countries there is strong evidence that the exports Granger cause the imports. These results highlight certain dependence of the imports to the exports in the three studied MENA countries. The following section will examine further this point.

Impulse response functions and forecast error variance decomposition analyses

This section will present the Impulse Response Functions (the IRFs) analysis depicting the responses of trade flows; i.e., the exports and the imports, to a positive shock in the real effective exchange rate, *reer*,[11] and the variance decomposition of the exports and the imports of each sample country across different periods. Note that a positive *reer* shock means an appreciation of the national currency with respect to a basket of trade partners' currencies.

Tunisia

Figure 2 displays the IRFs of Tunisia within a +/-2 standard errors (SEs) confidence interval. Based on the entire period data the IRFs show that a positive shock of the real exchange rate rapidly triggers a decrease of the volume of the exports and a momentary increase of the volume of the imports, in accordance with the theory. Nevertheless, these impacts of a change in the exchange rate are not statistically significant at the level of five percent. The IRFs of each sub-period reveal to certain extent different shapes with respect to the entire period's responses; in fact, during the normal period, in accordance with the theory, a positive shock (or innovation) of one standard deviation in the exchange rate induces a rapid decrease in the volume of the exports of 0.8 percent after just four months. This impact on the exports starts to be statistically significant two months after the shock and continues for more than thirty months long before it fades away. On the part of the imports, a positive shock of the exchange rate induces, in contradiction with the theory,

[8] FRED Economic Data by the Federal Reserve Bank of St. Louis.

[9] The X11 method was employed to convert the gross time series into seasonally adjusted series.

[10] The results are not shown for space-saving consideration but are available upon request.

[11] In this paper, a positive shock (interchangeably used with the term "innovation") of the exchange rate denotes an appreciation of the real effective exchange rate (reer) by one standard deviation.

a reduction of their volume that starts to be statistically significant by the fourth month following the shock. By this time the volume of imports decreases by almost 0.4 percent and remains at this new level for more than twenty-five months before it gains back its pre-shock level. On the other hand, the IRFs of the transition period show that a shock in the exchange rate (appreciation) has a minor and non-significant impact on the exports. This shock, however, lifts temporarily the volume of imports, as suggested by the economic theory, but as with the exports, this impact remains statistically insignificant.

Turning to the variance decomposition analysis (table 4), I find that, based on the entire period data, the variation of the exports is mostly impacted by shocks to its own lags (more than to 92 percent of the explained variance). This is followed by the industrial production index (up to 4 percent), and slightly by shocks to the real exchange rate (up to 1.9 percent). The variation of the imports is driven mainly by shocks in the exports (up to 54 percent), its own shocks (up to 63 percent) then the industrial production index (up to 4 percent).

The data of the normal period show that the variation of the exports is mostly impacted by its own shocks (more than 90 percent). However, the shocks in the real exchange rate explain at maximum 6 percent of this variation. The variation of the imports is almost explained by the same major forces as in the entire period; namely the exports and own shocks.

The transition period data reveal that besides its own shocks, the variation in the exports is driven by shocks in the industrial production index (up to 6 percent) and to a lesser degree the shocks in the exchange rate (only 0.6 percent). The variation of the imports is driven by mainly its own shocks (up to 67 percent), followed by the exports (up to 35 percent) and then the industrial production (up to 3.2 percent).

These findings highlight the low impact of the exchange rate on Tunisian foreign trade, though the existence of a mild impact on the exports is observed during the pre-Arab Spring period. This result points out the low effectiveness of exchange rate policies, especially the devaluation policy of the dinar (highly recommended by the IMF stabilization programs) during the transition period, in enhancing Tunisian exports and reducing the trade deficit. Another important result given by this empirical analysis is the relatively stronger dependence and attachment of Tunisian imports to the exports rather than to the exchange rate. The Granger causality and the variance decomposition analyses point out this strong relationship that explains the co-movement in the same direction of both the exports and the imports.

Egypt

Figure 3 shows the IRFs of Egypt within a +/-2 SEs confidence interval. Based on the entire period data, the IRFs show that a positive shock of the real exchange rate increases quickly and significantly the exports for about 2 percent by the fifth month. This impact remains for almost fifteen months before it fades away and loses its strength. Note that this result is in contradiction with the theory that suggests a shrink in the exports after a positive change of the *reer* rather than an expansion. As for the Egyptian imports, the response to a shock in the exchange rate is, in accordance with the theory, positive, quick and statistically significant; in fact, four months after the shock the volume of the imports increases by more than 1.5 percent. This upward effect on the imports remains statistically significant for nine months and then disappears.

During the normal and the transition periods the responses of Egyptian exports and imports are almost like their responses given by entire period's IRFs; i.e., a positive shock in the exchange rate triggers a rapid surge in the exports and the imports. Nevertheless, these upward responses of the trade to a *reer* shock are not statistically significant.

Table 5 describes the variance decomposition analysis. Based on the entire period data, the variation of the exports is mainly explained by its own shocks (up to 97 percent), followed by the shocks in the real exchange rate (up to 19 percent). The variation of the imports is principally driven by their own shocks (up to 98 percent), the exports (up to 13 percent), then, the shocks of the exchange rate (up to 9 only percent). Though their participation in the import's variation is lower than in Tunisia, this finding upholds the assertion of the dependence of the Egyptian imports to the exports during the entire period of study.

The variance decomposition analysis run on the normal period data confirms the importance of own shocks in explaining the exports variation in Egypt (up to 93 percent of the variance). This is followed by the imports and the interest rate (more than 6 percent, each). The variation of the imports is, however, mainly driven by own and export shocks.

The data of the transition period show that besides the importance of their own shocks, Egyptian exports variation is driven by the industrial production index (up to 12 percent). About the imports variation, the main explaining force is its own shocks (up to 97 percent) followed by the CPI (up to 8.2 percent) and, almost equally, the exchange rate and the industrial production index shocks (more than 5 percent, each).

These findings show the weak effectiveness of the Egyptian exchange rate policy in influencing trade and containing the increasing trade deficit, especially during the tumultuous post-Arab Spring period. Overall, the results also reveal a strong dependence of the imports to the exports.

Morocco

Figure 4 illustrates the IRFs of Morocco within a +/-2 SEs confidence interval. The entire period data show that an unanticipated increase in the real exchange rate

triggers, first, a temporary increase in Moroccan exports followed, in accordance with the theory, by a long decrease that start to be statistically significant from the sixth month following the shock. By the tenth month the exports decline by about 1 percent and their volume remains around this new lower level for a relatively long time before it regains their pre-shock level. The response of the imports to an exchange rate shock is similar in sign and nearly in intensity to the response of the exports, which is naturally in contradiction with the theory. After a temporary surge, an exchange rate shock triggers a reduction in the imports that becomes statistically significant from the tenth month following the shock. The volume of imports hits the bottom by the thirteenth month (-0.7 percent) and remains at this lower level for a relatively long period before it returns to its pre-shock level.

The responses of Moroccan exports and imports to a positive shock in the real exchange rate during the normal period are almost like their responses illustrated by the entire period-based-data-IRFs. The only difference is that the significantly reducing impact of the exchange rate shock lasts for shorter times before it fades away and the volumes of the exports and the imports return to their pre-shock level. The transition period's IRFs show a different behavior of Moroccan trade resulting from an unanticipated innovation in the *reer*. In fact, the responses of the exports and the imports are similarly fluctuating but remains mute and not statistically significant.

The variance decomposition of the exports during the entire period (table 6) is mostly impacted by their own shock (up to 93 percent of the explained variance), followed by the exchange rate (up to 6.4 percent) then shocks of the imports (up to 5.7 percent). On the other hand, the variation of the imports is mostly driven by their own shocks (up to 89 percent) and the shocks of the exports (up to almost 15 percent). The shocks in the exchange rate explain, however, this variance to a lesser degree; i.e., less than 3 percent.

During the normal period, the variations of the exports are principally explained by their own shocks (up to 93 percent). This is followed by the shocks in the exchange rate (up to 12 percent of explained variance). The imports variance is mostly explained by own and exports shocks (up to 86 and 15.7 percent, respectively). The exchange rate shock represents only up to 5 percent of the explained variance. On the other hand, the transition period data reveal that the exports variation is mainly explained by their own shocks but at a lesser degree than the normal period. This is followed by the interest rate (up to 30 percent), the imports (up to 17 percent). The shocks in the exchange rate explain only a small part of the exports variation (up to only 3 percent). The variation of the imports is highly explained by their own shocks (up to 98 percent of the total variation). This is followed by the shocks in the interest rate and the exchange rate (up to 9 percent and 4 percent respectively). Unlike the entire and normal periods, the shocks in Moroccan exports during the transition period weakly explain the imports variations. This finding highlights a significant reduction of the dependence of Moroccan imports to the exports during this period.

Overall, the empirical findings show that during the periods of study the Moroccan exchange rate policy is weakly effective in impacting the trade. They highlight also a strong dependence of the imports to the exports despite the decline of this dependence during the transition period. This is most likely one of the factors behind the significant improvement in Moroccan trade deficit during the period of transition as shown by figure 1.

The low effectiveness of exchange rate policies in impacting trade in Tunisia, Egypt and Morocco, notably during the transition periods, upholds the literature suggestion that emerging economies' trade, particularly the exports, are weakly elastic to the changes in the exchange rates[12]. Indeed, the literature points out that MENA's trade is highly dependent on foreign demand fluctuations and product specialization (European Investment Bank, 2016). The global financial crisis that hit advanced economies in 2008 and remained for several years afterwards has hampered world demand and consequently emerging economies exports. This decrease in external demand seems to have eliminated the already weak effect of the exchange rate on MENA's trade, particularly the exports. This assertion is demonstrated by the statistically non-significant IRFs observed for all three countries during the post-Arab Spring periods.

Overall, the IRFs of these MENA OICs endorse the findings of Taglioni (2012) on the ambiguity in sign and statistical significance of the relationship between trade and the level of the exchange rate. It is obvious, therefore, that the improvement in the exports, and containing the widening trade deficits depend on the improvement in the non-price competitiveness in foreign markets of the goods and services produced in these countries. This challenge would likely favor a reallocation of resources towards the more dynamic and creative domestic producers and exporters (Marin, 1985 and Ekholm and *al*, 2012).

[12] To check the robustness of my results several IRFs depicting the impact of an exchange rate shock on the trade balances of the sample countries are estimated. In general, the results highlight the weak impact of the exchange rate on the balance of trade of the OICs, especially during the transition period. This result confirms my finding; namely the low effectiveness of the exchange rate policies in these countries on their exports and imports. The IRFs are not shown for space-saving considerations but are available upon request.

Another no less important finding of this research is the reliable evidence of a strong dependence and attachment of the imports in Tunisia, Egypt and Morocco to their exports, especially during the more stable pre-Arab Spring period. The increase (decrease) in the internal demand for foreign goods triggered by export-induced increases (decreases) in national revenues is likely one of the reasons behind this strong bond that ties the imports of these countries to their exports.

Conclusion

In this paper I examined the impact of exchange rate shocks on trade flows during the pre- and post- Arab Spring periods in three oil-importing countries in the MENA region; namely, Tunisia, Egypt and Morocco. The Impulse-Response Functions and the variance decomposition analyses demonstrate a weak impact of the exchange rate on the exports and the imports of these three countries. This impact becomes very weak and statistically not significant during the uncertain and unstable transitions periods. This weak effect has clearly made the exchange rate policies of these countries, especially Tunisia and Egypt, very ineffective in containing and improving their trade deficits. The improvement in the exports and accordingly the containment of the trade deficits depends most likely on other factors such as the external demand and non-price competitiveness of the product, as suggested by the literature, rather than counting solely on an exchange rate-induced-price competitiveness.

The results provided by the Granger causality, the IRFs, and the variance decomposition analyses provide strong evidence in favor of a significant attachment and dependence of the imports in these three MENA OICs to their exports. This relation is very likely behind the unsuccessful exchange rate devaluation policy, especially in Egypt and Tunisia, in controlling and improving their trade deficits.

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Annex :

Table 1 – Granger Causality Analysis: Tunisia

Variable	F – statistic	P. value
H0 : Exports does not Granger cause		
Imports	9.70079	0.000***
Industrial production index	9.70704	0.000***
CPI	0.86888	0.420
Interest rate	1.29842	0.275
REER	1.21038	0.300
H0 : Imports does not Granger cause		
Exports	0.77124	0.463
Industrial production index	8.51721	0.000***
CPI	1.11951	0.328
Interest rate	0.59441	0.552
REER	1.85525	0.159
H0 : Industrial production index does not Granger cause		
Exports	0.50620	0.603
Imports	2.73200	0.067*
CPI	1.41122	0.246

Interest rate	0.67323	0.511
REER	1.12518	0.326
H0 : CPI does not Granger cause		
Exports	0.32213	0.725
Imports	0.94837	0.389
Industrial production index	0.77231	0.463
Interest rate	0.89457	0.410
REER	1.29051	0.277
H0 : Interest rate does not Granger cause		
Exports	1.06032	0.348
Imports	2.13324	0.121
Industrial production index	1.91315	0.150
CPI	2.47925	0.086
REER	0.24754	0.780
H0 : REER does not Granger cause		
Exports	2.87121	0.058*
Imports	4.94658	0.008***
Industrial production index	4.42471	0.013**
CPI	5.31872	0.005***
Interest rate	0.57581	0.563

Table 2 – Granger Causality Analysis: Egypt

Variable	F – statistic	P. value
H0 : Exports does not Granger cause		
Imports	16.018	0.000***
Industrial production index	12.3058	0.000***
CPI	17.8652	0.000***
Interest rate	6.59038	0.011**
REER	17.2344	0.000***
H0 : Imports does not Granger cause		
Exports	1.60196	0.207
Industrial production index	6.96304	0.009***
CPI	3.88945	0.049**
Interest rate	1.22752	0.270
REER	3.97796	0.047**
H0 : Industrial production index does not Granger cause		
Exports	4.75167	0.031**
Imports	2.15853	0.143
CPI	0.21677	0.642
Interest rate	0.69476	0.406
REER	0.21643	0.642
H0 : CPI does not Granger cause		
Exports	0.77753	0.379
Imports	5.39488	0.021**
Industrial production index	3.82966	0.052*
Interest rate	3.98232	0.048**
REER	0.61281	0.434
H0 : Interest rate does not Granger cause		
Exports	1.84571	0.177
Imports	0.00979	0.921
Industrial production index	3.89084	0.050*
CPI	0.70772	0.401
REER	1.98285	0.161
H0 : REER does not Granger cause		
Exports	0.82222	0.365
Imports	0.79208	0.374
Industrial production index	1.57169	0.211
CPI	9.33358	0.002**
Interest rate	0.89695	0.345

Table 3 – Granger Causality Analysis: Morocco

H0 : Variable	F – statistic	P. value
Exports does not Granger cause		
Imports	5.16901	0.000***
Industrial production index	0.84373	0.520
CPI	2.13092	0.063*
Interest rate	0.27136	0.928
REER	0.78661	0.560
H0 : Imports does not Granger cause		
Exports	3.35970	0.006***
Industrial production index	0.53765	0.747
CPI	1.50424	0.190
Interest rate	1.46701	0.202
REER	1.93854	0.089*
H0 : Industrial production index does not Granger cause		
Exports	6.55205	0.000***
Imports	4.93882	0.000***
CPI	3.45252	0.005***
Interest rate	0.40684	0.843
REER	2.19553	0.056*
H0 : CPI does not Granger cause		
Exports	2.73727	0.020**
Imports	2.36045	0.041**
Industrial production index	0.39595	0.851
Interest rate	1.11013	0.356
REER	1.71026	0.133
H0 : Interest rate does not Granger cause		
Exports	1.68251	0.140
Imports	1.26061	0.282
Industrial production index	1.00399	0.416
CPI	1.74038	0.126
REER	0.94876	0.450
H0 : REER does not Granger cause		
Exports	1.69391	0.137
Imports	2.05756	0.072*
Industrial production index	0.65227	0.660
CPI	1.54075	0.178
Interest rate	3.03121	0.011**

Table 4 – Variance Decomposition Analysis: Tunisia

Period	S.E.	log Exports	log Imports	log Ind.index	log CPI	Interest rate	log REER
Response: (log) Exports (2000 - 2017)							
1	0.080717	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.085217	98.66494	0.431652	0.006159	0.000796	0.129630	0.766823
3	0.095852	97.60253	0.349805	1.121578	0.004318	0.139234	0.782540
4	0.099700	96.58401	0.458501	1.684530	0.009962	0.203916	1.059081
5	0.104153	95.66501	0.426142	2.463936	0.016024	0.251472	1.177415
6	0.106854	94.83104	0.430196	3.017733	0.023491	0.334886	1.362658
7	0.109312	94.14719	0.413869	3.484249	0.031246	0.424571	1.498874
8	0.111121	93.55265	0.404036	3.816749	0.039765	0.537262	1.649535
9	0.112661	93.05262	0.393331	4.059863	0.048610	0.661006	1.784572
10	0.113893	92.61232	0.384914	4.224548	0.057910	0.799113	1.921194
Response: (log) Imports (2000 - 2017)							
1	0.075418	36.76669	63.23331	0.000000	0.000000	0.000000	0.000000
2	0.080298	42.41163	55.88516	1.298320	0.130129	0.017341	0.257419
3	0.085107	47.12012	50.18182	1.994185	0.158459	0.255558	0.289849

4	0.087702	49.58637	47.34575	2.142207	0.184051	0.468119	0.273503
5	0.090147	51.46445	44.83079	2.558898	0.198788	0.683551	0.263522
6	0.091950	52.58823	43.11257	2.918196	0.211648	0.909838	0.259512
7	0.093520	53.46435	41.68476	3.243645	0.223082	1.128830	0.255339
8	0.094791	54.06913	40.58078	3.510035	0.234082	1.352340	0.253631
9	0.095884	54.54145	39.66370	3.724200	0.244709	1.573738	0.252204
10	0.096807	54.89408	38.91300	3.890797	0.255184	1.795200	0.251743

Period	S.E.	log Exports	log Imports	log Ind.index	log CPI	Interest rate	log REER
Response: (log) Exports (2000 - 2011 M7)							
1	0.083142	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.087821	95.63694	1.251399	0.638581	0.044058	0.009680	2.419342
3	0.092283	95.40651	1.136769	0.699751	0.092575	0.042929	2.621468
4	0.093482	94.36100	1.387831	0.732285	0.104693	0.045592	3.368598
5	0.094312	93.83555	1.363938	0.800370	0.107539	0.059764	3.832841
6	0.094772	93.19636	1.369709	0.868148	0.107142	0.059387	4.399251
7	0.095122	92.66102	1.359896	0.919082	0.106370	0.059290	4.894340
8	0.095419	92.12908	1.351833	0.955966	0.105853	0.059031	5.398241
9	0.095688	91.63018	1.344326	0.982123	0.105697	0.058799	5.878870
10	0.095944	91.14660	1.337312	1.000605	0.105910	0.058571	6.350998
Response: (log) Imports (2000 - 2011 M7)							
1	0.078093	35.69829	64.30171	0.000000	0.000000	0.000000	0.000000
2	0.085862	39.76223	53.33225	5.463796	0.173491	0.902674	0.365551
3	0.088504	41.90863	50.43136	5.243157	0.438164	1.313300	0.665386
4	0.089447	42.49919	49.52725	5.133360	0.647189	1.386408	0.806608
5	0.090042	42.83145	48.87446	5.073224	0.803333	1.469543	0.947985
6	0.090386	42.81329	48.50863	5.054113	0.933055	1.582929	1.107988
7	0.090630	42.74793	48.24699	5.040548	1.044702	1.666744	1.253091
8	0.090825	42.63535	48.04053	5.030959	1.143647	1.742748	1.406775
9	0.090992	42.51489	47.86531	5.022448	1.233992	1.803774	1.559590
10	0.091142	42.39190	47.70863	5.014238	1.317470	1.852409	1.715349

Period	S.E.	log Exports	log Imports	log Ind.index	log CPI	Interest rate	log REER
Response: (log) Exports (2011 M8 - 2017)							
1	0.066075	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.067350	96.67629	0.111018	1.344914	1.030983	0.718686	0.118113
3	0.071737	93.60007	0.447745	4.018597	0.908837	0.918394	0.106358
4	0.072405	92.22830	0.443669	4.893250	0.933398	1.396178	0.105204
5	0.073758	91.58226	0.458256	5.356673	0.907211	1.593806	0.101791
6	0.074161	91.11411	0.469780	5.609976	0.926974	1.778398	0.100760
7	0.074633	90.83259	0.490013	5.782490	0.923583	1.870772	0.100548
8	0.074850	90.62546	0.498160	5.898665	0.926657	1.949398	0.101658
9	0.075043	90.49013	0.504982	5.978668	0.924905	1.998121	0.103194
10	0.075155	90.39383	0.508798	6.031798	0.924405	2.035803	0.105363
Response: (log) Imports (2011 M8 - 2017)							
1	0.067743	33.17066	66.82934	0.000000	0.000000	0.000000	0.000000
2	0.069050	32.54352	65.42798	0.236389	0.147251	0.051482	1.593379
3	0.070527	33.74560	62.81418	1.587123	0.145409	0.161385	1.546301
4	0.071033	33.70483	61.92427	2.405830	0.150851	0.277801	1.536413
5	0.071620	34.26318	60.93912	2.763367	0.148717	0.356522	1.529089
6	0.071900	34.45707	60.47284	2.939720	0.151667	0.426823	1.551878
7	0.072152	34.66159	60.06304	3.066240	0.151867	0.477517	1.579745
8	0.072313	34.75146	59.80378	3.154702	0.151764	0.521556	1.616742
9	0.072450	34.83252	59.58476	3.217693	0.151195	0.556858	1.656972
10	0.072552	34.87920	59.42160	3.261011	0.150854	0.586844	1.700493

Table 5 – Variance Decomposition Analysis: Egypt

Period	S.E.	log Exports	log Imports	log Ind.index	log CPI	Interest rate	log REER
Response: (log) Exports (2007 - 2015 M9)							
1	0.082379	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.089650	96.72644	1.258030	0.130420	5.77E-05	0.038311	1.846738
3	0.093232	91.83915	2.787693	0.468926	0.008675	0.050855	4.844699
4	0.096388	86.77343	4.084339	1.040944	0.049129	0.047584	8.004573
5	0.099494	81.96454	5.085563	1.857807	0.135634	0.059079	10.89738
6	0.102621	77.48929	5.830246	2.917203	0.271954	0.101279	13.39003
7	0.105799	73.33618	6.365060	4.203136	0.455439	0.175287	15.46490
8	0.109038	69.47946	6.729949	5.688825	0.680185	0.274332	17.14725
9	0.112344	65.89526	6.958229	7.340694	0.938975	0.389154	18.47769
10	0.115717	62.56354	7.077901	9.122142	1.224410	0.510936	19.50107
Response: (log) Imports (2007 - 2015 M9)							
1	0.096299	12.02650	87.97350	0.000000	0.000000	0.000000	0.000000
2	0.109183	12.85678	85.72943	0.000973	0.372533	0.020745	1.019536
3	0.115048	13.07414	83.12778	0.017621	1.092248	0.022738	2.665476
4	0.119262	13.06688	80.36802	0.128451	2.028106	0.024969	4.383581
5	0.122969	12.99223	77.54491	0.409968	3.088280	0.054677	5.909933
6	0.126509	12.90698	74.68943	0.908989	4.212397	0.122374	7.159825
7	0.130005	12.82918	71.81790	1.641289	5.358452	0.224087	8.129086
8	0.133510	12.76241	68.94950	2.598442	6.495824	0.349029	8.844803
9	0.137048	12.70530	66.10771	3.755787	7.602075	0.485228	9.343900
10	0.140625	12.65536	63.31737	5.079403	8.661295	0.622403	9.664169

Period	S.E.	log Exports	log Imports	log Ind.index	log CPI	Interest rate	log REER
Response: (log) Exports (2007 - 2011 M10)							
1	0.077852	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.081667	93.18545	5.101402	0.000199	0.003909	1.623977	0.085064
3	0.083249	91.39044	5.307943	0.002538	0.060565	2.936592	0.301919
4	0.084371	89.81632	5.367145	0.005439	0.141375	4.001922	0.667802
5	0.085386	88.40047	5.415125	0.011477	0.233856	4.784478	1.154592
6	0.086383	87.05599	5.510927	0.025887	0.331289	5.349804	1.726102
7	0.087400	85.74406	5.661269	0.057077	0.431621	5.756418	2.349553
8	0.088451	84.44223	5.859042	0.115642	0.534380	6.048425	3.000281
9	0.089543	83.13745	6.092188	0.212880	0.639617	6.256371	3.661493
10	0.090682	81.82053	6.349042	0.359502	0.747463	6.400961	4.322502
Response: (log) Imports (2007 - 2011 M10)							
1	0.097875	19.58863	80.41137	0.000000	0.000000	0.000000	0.000000
2	0.106940	25.50797	73.81066	0.091790	0.266054	0.322535	0.000996
3	0.109865	26.52814	71.57638	0.207336	0.650081	1.013416	0.024650
4	0.111650	26.92880	69.86623	0.318877	1.067697	1.722491	0.095907
5	0.113138	27.12970	68.40411	0.423132	1.468873	2.348500	0.225678
6	0.114544	27.27945	67.07002	0.526635	1.838217	2.872914	0.412759
7	0.115941	27.41617	65.81555	0.637212	2.173205	3.307298	0.650568
8	0.117358	27.54850	64.61420	0.762195	2.475983	3.667798	0.931327
9	0.118809	27.67587	63.44952	0.908189	2.749969	3.968456	1.247993
10	0.120302	27.79550	62.30990	1.081110	2.998608	4.220056	1.594823

Period	S.E.	log Exports	log Imports	log Ind.index	log CPI	Interest rate	log REER
Response: (log) Exports (2011 M11 - 2015 M9)							
1	0.075373	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000

2	0.080230	91.03749	0.211261	7.242099	0.056287	0.049552	1.403308
3	0.082564	87.67571	0.281888	9.679604	0.111973	0.062213	2.188615
4	0.083869	85.55226	0.524929	10.89923	0.185430	0.064867	2.773283
5	0.084666	84.16043	0.815223	11.51572	0.272789	0.063798	3.172042
6	0.085167	83.24989	1.055391	11.84191	0.368029	0.064250	3.420532
7	0.085478	82.67217	1.213305	12.02291	0.464772	0.068577	3.558269
8	0.085668	82.31729	1.296880	12.12867	0.557774	0.076554	3.622833
9	0.085784	82.10212	1.329805	12.19315	0.643429	0.086564	3.644931
10	0.085858	81.96718	1.336413	12.23311	0.719752	0.096751	3.646790
Response: (log) Imports (2011 M11 - 2015 M9							
1	0.094559	2.809200	97.19080	0.000000	0.000000	0.000000	0.000000
2	0.108558	2.516826	91.43490	2.293473	0.715017	0.475086	2.564703
3	0.115659	2.221946	88.09569	3.231120	1.705662	0.618581	4.126996
4	0.119783	2.071693	85.68781	3.920001	2.803744	0.612359	4.904394
5	0.122229	1.991888	83.87910	4.450141	3.918123	0.588097	5.172654
6	0.123738	1.956320	82.41842	4.864130	4.990800	0.587508	5.182826
7	0.124782	1.957376	81.16811	5.180572	5.977974	0.608900	5.107066
8	0.125648	1.994242	80.05423	5.412758	6.850344	0.638669	5.049759
9	0.126490	2.066646	79.03772	5.573891	7.594578	0.664978	5.062183
10	0.127374	2.172096	78.09853	5.677950	8.211907	0.681711	5.157807

Table 6 – Variance Decomposition Analysis: Morocco

Period	S.E.	log Exports	log Imports	log Ind.index	log CPI	Interest rate	log REER
Response: (log) Exports (2000 - 2017)							
1	0.069246	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.075707	93.05817	3.522024	1.834194	0.428321	0.883201	0.274092
3	0.078988	92.20437	3.262128	1.746891	0.556284	1.168596	1.061732
4	0.081444	88.87747	5.121713	2.029246	1.608202	1.250811	1.112561
5	0.082662	87.96435	5.129327	2.047750	2.392082	1.214235	1.252258
6	0.083351	86.60980	5.222954	2.696661	2.436093	1.713874	1.320622
7	0.084416	84.57213	5.607077	2.644365	2.610532	2.311365	2.254531
8	0.085702	82.30452	5.792772	2.828078	2.763657	2.648971	3.662000
9	0.087056	80.00841	5.762689	2.844828	3.165034	3.110951	5.108090
10	0.088564	77.45155	5.739426	3.026989	3.414655	3.933271	6.434113
Response: (log) Imports (2000 - 2017)							
1	0.064129	10.62546	89.37454	0.000000	0.000000	0.000000	0.000000
2	0.067741	13.09919	83.89020	1.375036	1.625162	0.006408	0.004004
3	0.070762	14.51307	79.51483	2.737055	1.569035	0.489000	1.177015
4	0.075792	14.78842	78.86930	2.549997	1.764799	0.899008	1.128474
5	0.077530	14.24478	76.18032	3.745448	3.589890	1.083890	1.155670
6	0.079545	13.53418	76.41335	4.164931	3.710066	1.079295	1.098178
7	0.081362	12.95581	76.16084	4.952245	3.597597	1.044942	1.288568
8	0.082358	13.05465	75.21021	5.648879	3.535939	1.020003	1.530312
9	0.083751	12.91123	74.19394	6.001184	3.776649	1.102711	2.014285
10	0.085116	12.88906	72.86039	6.599298	3.805710	1.136902	2.708648
Period	S.E.	log Exports	log Imports	log Ind.index	log CPI	Interest rate	log REER
Response: (log) Exports (2000 - 2012 M2)							
1	0.075006	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.080657	93.17253	3.992219	0.600582	1.144077	0.214558	0.876030
3	0.084982	89.17512	4.383926	0.764307	1.403747	2.028291	2.244605
4	0.087211	85.78371	5.404015	0.728925	3.310358	1.974611	2.798383
5	0.089744	82.59997	5.152289	0.988044	5.165816	2.193538	3.900339
6	0.090423	81.53325	5.084476	1.003859	5.668563	2.180273	4.529583
7	0.092331	78.20767	4.939677	2.028865	5.467459	2.243553	7.112771

8	0.093616	76.07659	4.987859	2.063940	5.326045	2.244971	9.300595
9	0.094635	74.45017	4.882277	2.169882	5.342768	2.293387	10.86152
10	0.095714	72.80911	4.772893	2.134066	5.286039	2.759400	12.23850

Response: (log) Imports (2000 - 2012 M2)

1	0.067909	13.44545	86.55455	0.000000	0.000000	0.000000	0.000000
2	0.070660	15.10832	82.52898	0.213131	1.732572	0.405898	0.011096
3	0.073146	15.57842	78.51925	0.808184	1.770559	0.434892	2.888697
4	0.077802	15.76721	76.53818	2.639480	1.901929	0.592486	2.560717
5	0.079959	15.08607	72.58791	2.650054	5.317770	1.684610	2.673577
6	0.081313	14.61873	72.51184	2.571335	5.764081	1.879886	2.654128
7	0.082732	14.28327	72.36997	2.487622	5.586012	1.959870	3.313258
8	0.083187	14.14493	72.07487	2.463062	5.539827	2.041814	3.735492
9	0.083843	13.93507	71.61128	2.425881	5.777820	2.094332	4.155616
10	0.084575	13.71275	70.95814	2.529295	5.704500	2.111480	4.983833

Period	S.E.	log Exports	log Imports	log Ind.index	log CPI	Interest rate	log REER

Response: (log) Exports (2012 M3 - 2017)

1	0.043256	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.051639	71.83034	1.865236	13.02976	0.032761	12.92930	0.312600
3	0.057627	57.68110	6.437505	12.25547	0.056953	23.25766	0.311305
4	0.064853	45.65391	13.10945	10.65924	0.546729	28.55827	1.472401
5	0.067889	41.66112	16.28360	10.02676	0.849744	28.57588	2.602908
6	0.069553	40.47805	16.54018	9.717889	0.873032	29.90321	2.487639
7	0.069778	40.24747	16.57289	9.978674	0.883979	29.80269	2.514290
8	0.069952	40.23951	16.54320	9.970399	0.893033	29.75551	2.598345
9	0.070192	39.97571	16.96712	9.965253	0.905279	29.56300	2.623648
10	0.070582	39.55089	17.14772	9.877400	0.923503	29.48681	3.013672

Response: (log) Imports (2012 M3 - 2017)

1	0.062014	1.647739	98.35226	0.000000	0.000000	0.000000	0.000000
2	0.064476	2.616702	92.53362	0.066806	0.175226	1.730915	2.876727
3	0.068177	2.701848	83.77651	0.696032	0.509073	8.987635	3.328898
4	0.072794	2.517380	83.81027	0.811498	1.972605	7.952387	2.935859
5	0.073340	2.592332	82.65850	0.905465	2.018842	8.928254	2.896608
6	0.075051	2.484056	81.71877	0.865689	1.927831	8.935927	4.067725
7	0.076698	3.204305	79.41017	1.322866	3.221637	8.762285	4.078739
8	0.077091	3.286139	78.61469	1.585936	3.706332	8.687772	4.119136
9	0.077457	3.259091	78.28300	1.691196	3.710527	8.975627	4.080558
10	0.077765	3.251989	77.78518	1.696086	4.050828	9.075749	4.140167

Figure 1: External balance on goods and services (% of GDP), World Bank

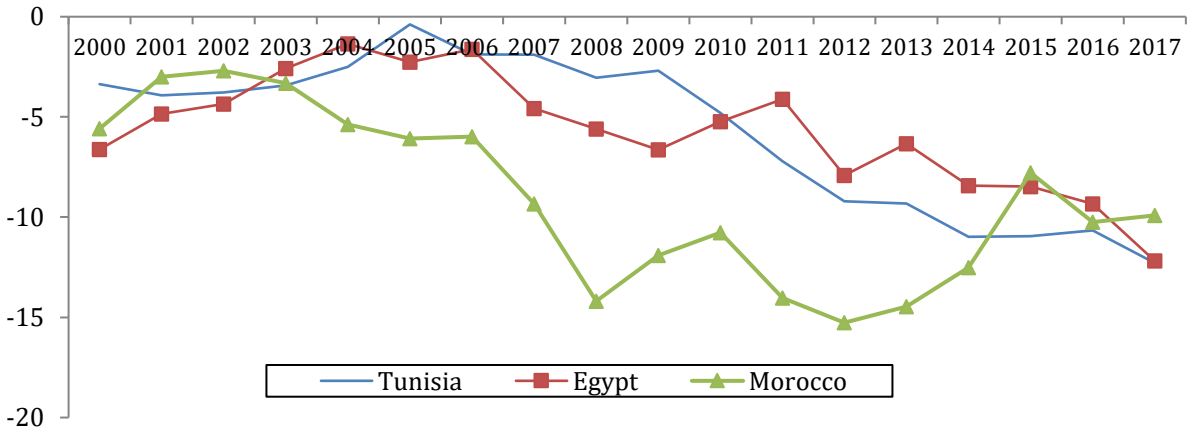

Figure 2: IRFs, Tunisia

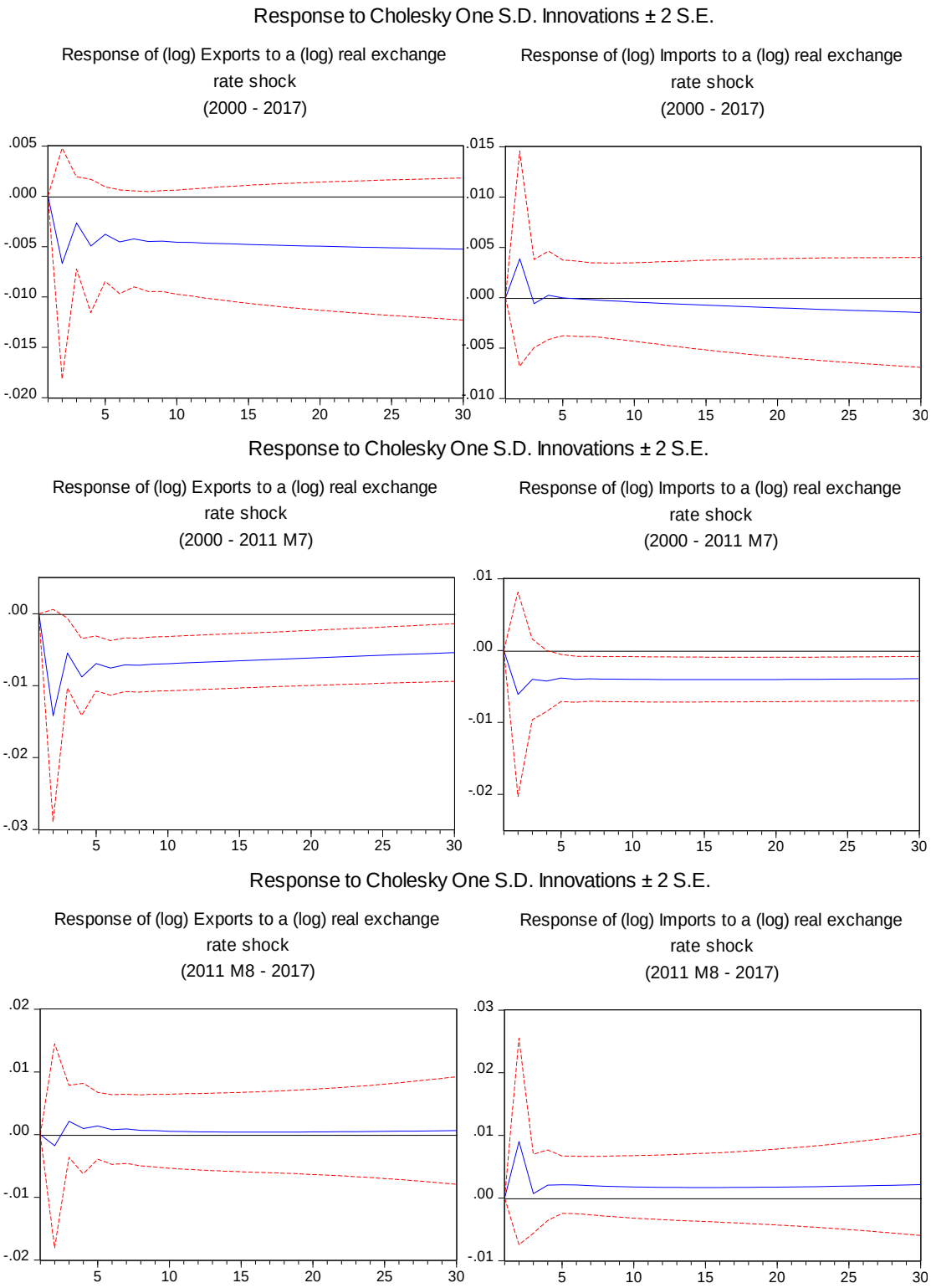

Figure 3: IRFs, Egypt

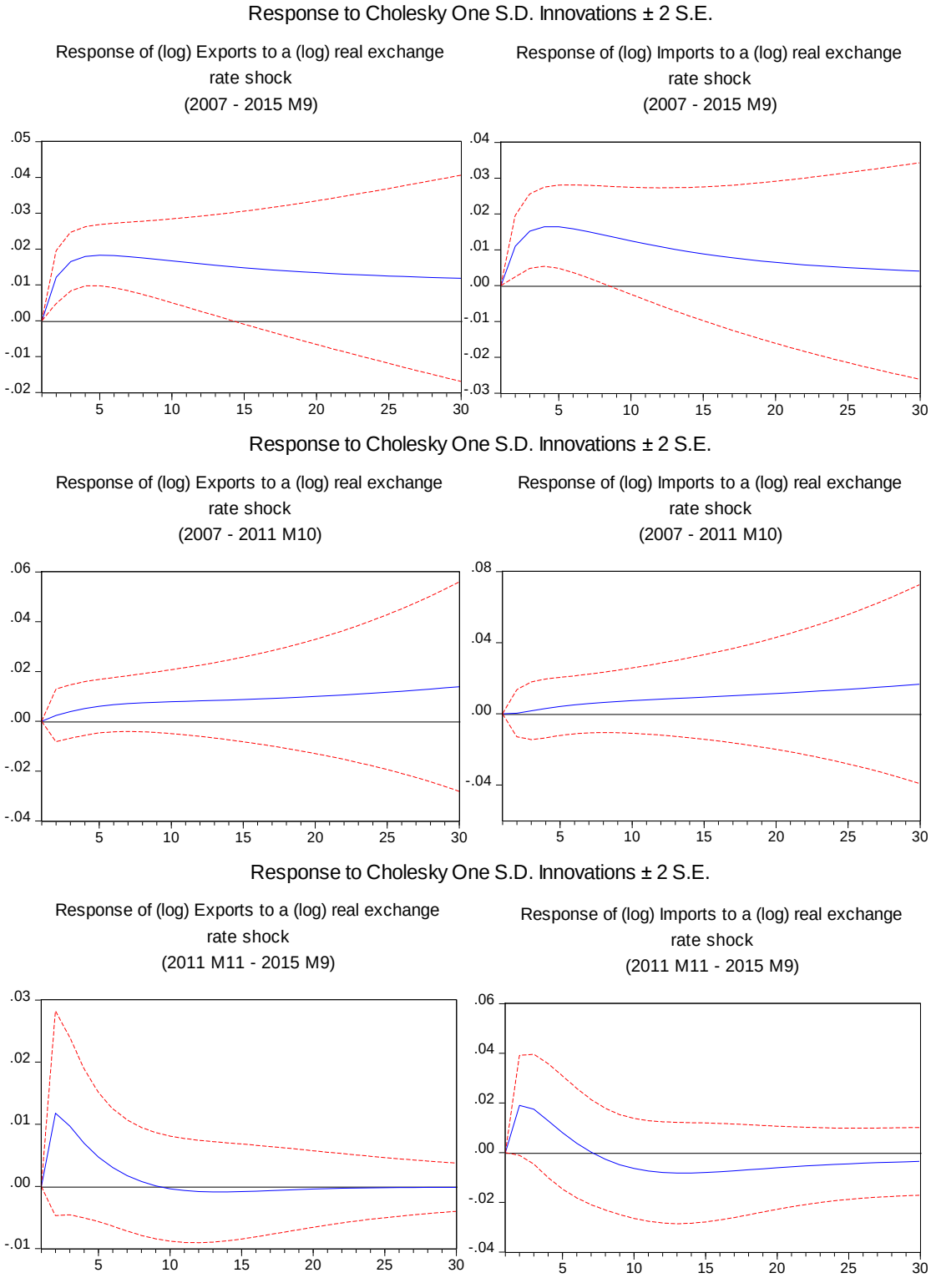

Figure 4: IRFs, Morocco