Features of Business Cycles across the Middle East and North Africa: A Nonparametric Analysis

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Abstract

In this paper, we provide a compressive analysis of business cycle characteristics across a large set of countries in the MENA region. Contrary to the majority of the papers on business cycles synchronization across the MENA region countries, we concentrate on the appearance of the cycle, not on its synchronization. We use robust methods that are not based on ad hoc filtering or parametric methods. Our findings suggest that important differences exist in the business cycle characteristics of the MENA region economies. We find evidence against a common reference cycle for a group of countries. Although the business cycle characteristics show some similarities among some small number of countries, overall the business cycle characteristics across the MENA countries are dissimilar.

1 Introduction

Increasing number of countries in the Middle East and North Africa (MENA) region are opting for increased regional economic integration in the future. Increased cross-border trade, partly provided through the lifting of trade barriers within the frameworks of the Gulf Cooperation Council (GCC) and the Greater Arab Free Trade Area (GAFTA), is an important part of the economic integration. A recent UN (2000) report notes that because of the unstable monetary, macroeconomic, and financial environments in certain parts of the MENA region, it is doubtful that macroeconomic policy coordination will benefit the member countries. The UN report examines the implications of policy coordination and, ultimately, the adoption of a common single currency and comments that such adoption is likely to succeed if optimum currency area (OCA) conditions are fulfilled. A key requirement in the OCA theory is the business cycle symmetry among currency union members. The report assesses the degree of business cycle synchronization in the Middle East region and finds that business cycles have not become highly synchronized with one another but the degree of business cycle synchronization is related to trade intensity. Predicting that trade links would increase in the future the UN report suggests that member countries would benefit from macroeconomic policy coordination and formation of an OCR. Hirata et al. (2007) assumes a common synchronized business cycle for MENA and examines the implications of an aggregate dynamic stochastic general equilibrium model. They state that the model captures some important structural characteristics of the MENA economies and is able to replicate the main properties of their common business cycles. However, there has been no study thoroughly examining the characteristics of business cycles in the MENA region. A common MENA business cycle is not demonstrated by empirical evidence rather it is assumed, except the examination of cycle synchronization in UN (2005) and Gallagati et al. (2004), which is limited to a few countries in the MENA . The main objective of this paper is to fill this gap by a through examination of business cycle characteristics using the methods of modern business cycle theory.

The recent growing macroeconomic research interest on the MENA economies concentrated on sources of business cycle and business cycle synchronization. The volatile changes in the MENA region economies during the last three decades created controversies about the relative importance of potential sources of business cycle movements. 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). Mehrara and Oskoui (2007) used a structural vector autoregressive (SVAR) model to examine the sources of business cycle movements 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 MANE region

In this paper we go behind the assumptions made in the previous literature. We use a nonparametric business cycle turning point determination method based on the Bry-Boschan algorithm and estimate business cycle characteristics using the measures proposed in Harding and Pagan (2002). In this way, we analyze the comovements across economies without initially assuming that they should or should not move together. That is we let the "data speak" without imposing any kind of a priori restrictions. Using these robust statistical methods we are able to check which economies are close and which are further away from each other. This approach will also allow us to answer the leading question about the existence of a common MENA region business cycle.

Specifically, the study describes the business cycle characteristics of a group of 22 MENA countries. The business cycle characteristics are examined using the real GDP series. These include average business durations, amplitude, accumulations, and excess (see Harding and Pagan 2002a,2002b, 2003). Rather than calculating pairwise business cycle synchronization indexes between countries, we determine how close are these countries to each other in terms of their business cycle characteristics. In the study, we use quarterly (annual data is used if

quarterly data is not available for a country in a particular period) over the period 1960-2012 to analyze business cycle movements in the following countries: Algeria, Bahrain, Bangladesh, Egypt, Iran, Iraq, Israel, Kuwait, Lebanon, Libya, Malta, Mauritania, Morocco, Oman, Pakistan, Qatar, Saudi Arabia, Sudan, Syria, Tunisia, Turkey, and United Arab Emirates.

In this study we find statistical evidence in contrast to the existence of a common MENA region business cycle whose characteristics would be shared by all or a group of countries. Although there is some evidence of a group of countries clustering close to each other, once the effect of two outlier observations are taken into account all countries are spread on a single map with one big cluster, which is no grouping at all since the measure of distance between distant countries is too large. But, there is some little evidence of closeness among some countries based on geographic proximity or trade links. Finally, we find that the evidence is not related to sample period we used. We split our data set into two subsets at 1985. We observe same characteristics in both samples, although there is some evidence that business cycles for the period 1986-2006 are more volatile.

The rest of the paper is organized as follows. In Section 2, se describe the data and present our methodology. Section 3 presents characteristics of the business cycle in the MENA economies based on the empirical analysis. Section 4 concludes the paper.

2 Data and Methodology

In any study of business cycle the foremost and most important question is to define and detect cycles. In their classic work, Burns and Mitchell (BM) (1946) define specific cycles in a series y_t, $y_t = \log(\text{GDP}_t)$ in this study, in terms of turning points in its sample path. This tradition has been central to work at the NBER and other institutions such as the IMF (2002) and OECD. The best-known algorithm for performing these tasks is that associated with the NBER and set out in Bry and Boschan (BB) (1971). An issue for using the BB algorithm for other countries is that there is no widely accepted reference chronology of the classical business cycle for other countries. In order deal with this problem, we use dating algorithm of Harding and Pagan (2002) that isolates the local minima and maxima subject to reasonable constraints on both the length and amplitude of expansions and contractions. The BB algorithm is applied to the level, mostly after taking logarithms, of the series. Mintz (1969, 1972) applied the BB algorithm to the level of economic time of some surging economies, such as the former West Germany, and failed to find turning points. This led researchers to consider detrending the variables and apply the BB algorithm to the detrended series. In this study, we also determine the cycles from the log differenced series resulting in *growth cycles*. Although differencing may also be considered as a detrending filter it is not subject to the critics directed to filters such as the HP. Such filters, although commonly used, distorts the cyclical properties of the data and leads to biased estimates of turning points. Pagan (1997) showed that removing the stochastic trend with a HP filter resulted in series with cycles that were around 3 years long and, hence, almost half that of the business cycle. Previous studies found growth cycles to be more useful for analyzing business cycle in countries that experience sharp contractions and expansions in growth rates. In a growth cycle, a recession is defined as a phase when output is below its trend. Analogously, an expansion is defines as a phase when output is above its trend.

Recently, amongst the business cycle researchers, the summaries of characteristics of business cycle changed from a graphical orientation towards quantitative measures involving the moments of selected variables (Cooley and Prescott, 1995; Harding and Pagan 2002a, 2002b, 2003). Based on BM study Harding and Pagan (2002a) suggested that there are four characteristics of interest: The duration of the cycle and its phases, the amplitude of the cycle and its phases, any asymmetric behavior of the phases, and cumulative movements within phases.

The *duration* refers to the length of an expansion or recession. The duration of an expansion corresponds to the time spent from a trough to following peak. Analogously, the duration of a recession is the time from a peak to the following trough. The second classical feature of a business cycle is its *amplitude*. The amplitude entails some ambiguity. Based on an argument put forward by Moore (1967) that a decline may not be considered as a trough until it reaches certain depth, the concept of amplitude refers to the depth of the decline or rise in the economic activity in terms of gains or losses in production. Therefore, the amplitude is not related to the timing of the cycle in any way. Harding and Pagan (2002a) proposed two measures of the depth of expansions and recessions in cycles, the *amplitude* and the *cumulation* of expansions and recessions. For an expansion phase, the amplitude represents the percentage gained in terms of production during the period of expansion relative to the level of output in the first period of the phase, and in case of recessions, the measure may be interpreted as the percentage lost. So the amplitude, in case of an expansion, is the percentage gain for a jump from a through to peak. The cumulation corresponds to the cumulated gain or loss and consists of the sum of the amplitudes for each period of the phase. We can interpret this measure as the loss in wealth in that economy. The cumulation is a measure that combines duration, amplitude and the shape of expansions or recessions. It approximates the effect of the business cycle phase on the wealth. Harding and Pagan (2002a) use a triangle approximation to calculate the cumulation. In practice the actual cumulative movements may differ from the triangular approximation since the actual path through the phase may not be well approximated by a triangle. In order the

remove move this bias Harding and Pagan (2002a) proposes an index of the *excess* cumulated movements. The excess is a bias corrected measure of percentage gain or loss per period of a phase.

3 Empirical Results

We estimated each of the measures of cycle characteristics for the 22 MENA countries for which the data is available. The data is obtained from the World Development Indicators published by the World Bank and the International Financial Statistics published by the IMF. For several countries quarterly data were not available for the full period and the estimations are obtained using annual data for these periods. Our data sample covers the 1960-2006 period and includes the real GDP series for each country measured in US dollars. In addition to full sample period we consider periods 1960-1985 and 1986-2012 as two distinct sub-periods (Kose et al. 2004 and Hirata et al. 2004 also split their data at 1985). The first period, 1960–1985, corresponds to the fixed exchange rate regime for the major industrial countries during the Bretton Woods (BW). This period also consist of global shocks associated with sharp fluctuations in the price of oil, and it is also a period of contractionary monetary policies in major industrial countries. The second period, 1986-2006 represents a period with dramatic increases in the volume of trade and financial flows (Prasad et al. 2003). We can isolate the impact of globalization by splitting the sample at 1985. Another reason, as pointed out by Hirata et al. (2004), to choose the mid-1980s as the break point is because it corresponds to a "structural policy break" in both the MENA and Asian emerging market economies. During the mid-1980s, the MENA countries undertook comprehensive reform and stabilization policies.

Table 1 gives estimates of four business cycle characteristics for the full sample period 1960-2012. The recessions are designated as peak-to-trough (PT) and expansions as trough-to-peak (TP). With the exception of duration statistics, all measurements are in terms of percentage changes. The cumulation is measured as the percentage of GDP in the first period of phase. The average duration of recessions (displayed in Figure 1) is 1.27 years while the average duration of expansions is 3.82 years. The average duration estimates are close to those observed in developed countries (see the estimates in Harding and Pagan, 2001). However, there are large differences among countries (see Figure 1). The range for the duration of recessions is about one year, while it is about three years for expansions. Algeria, Bahrain, Bangladesh, Egypt, and Morocco stand out with long periods of expansions, while Kuwait, Pakistan, and Turkey are marked with very short periods of expansions. The countries with longer (shorter) periods of expansions are not the countries with longer (shorter) periods of recessions. Iraq and Oman stand out with shortest duration of recessions while Saudi Arabia has the longest recession duration. The reported coefficients of variation indicate that expansions are more variable than recessions.

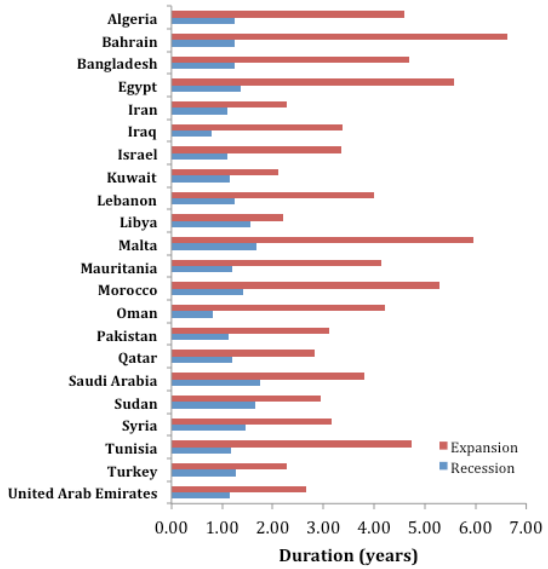

Figure 1. *Duration of Expansions and Recessions (Years in recession and expansion)*

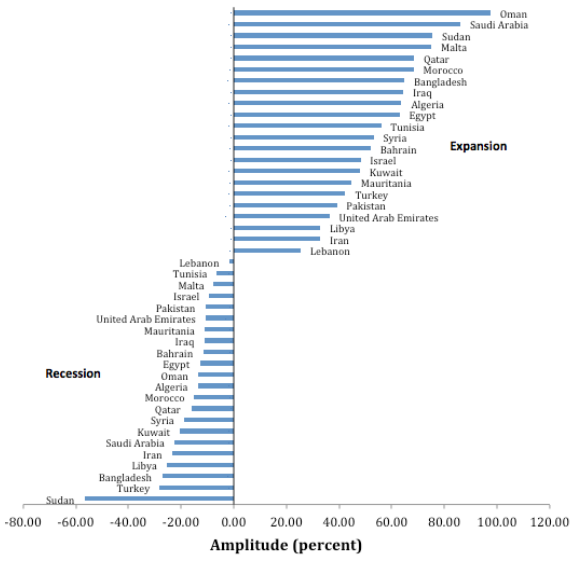

Figure 2. *Aplitude of Expansions and Recessions (Percentage of GDP in first year of phase)*

Country	*Recession (peak-to-trough)*				*Expansion (trough-to-peak)*			
	Duration	Amplitude	Cumulation	Excess	Duration	Amplitude	Cumulation	Excess
Algeria	1.25	-13.72	-47.19	-0.25	4.58	63.60	1915.33	6.36
Bahrain	1.25	-11.43	-35.44	0.48	6.63	52.02	1039.84	2.85
Bangladesh	1.25	-27.18	-76.76	1.01	4.70	64.88	636.60	2.76
Egypt	1.36	-12.90	-48.81	0.02	5.58	63.04	905.24	1.63
Iran	1.09	-23.44	-69.07	0.50	2.29	32.68	301.52	-0.42
Iraq	0.79	-11.24	-23.98	0.43	3.38	64.44	809.92	2.70
Israel	1.10	-9.39	-23.33	0.25	3.36	48.20	411.33	2.29
Kuwait	1.15	-20.48	-60.06	1.21	2.11	47.76	307.59	3.38
Lebanon	1.25	-1.62	-4.30	0.01	4.00	25.45	178.30	-1.58
Libya	1.56	-25.48	-86.80	0.96	2.21	32.80	210.50	1.15
Malta	1.67	-7.59	-33.36	0.25	5.95	75.14	1280.76	-1.80
Mauritania	1.19	-10.90	-29.81	0.21	4.14	44.74	587.52	1.86
Morocco	1.42	-15.03	-47.95	0.44	5.30	68.39	1270.43	-0.85
Oman	0.81	-13.50	-23.63	1.00	4.21	97.51	1260.38	12.04
Pakistan	1.13	-10.62	-29.90	1.21	3.11	39.15	575.27	2.32
Qatar	1.19	-16.15	-44.84	0.46	2.82	68.47	453.34	1.80
Saudi Arabia	1.75	-22.67	-169.95	0.11	3.80	86.14	646.59	3.36
Sudan	1.65	-56.44	-218.23	3.28	2.94	75.55	683.48	4.10
Syria	1.46	-19.02	-110.70	0.74	3.17	53.19	478.08	3.27
Tunisia	1.18	-6.48	-16.91	-0.07	4.75	55.96	1084.19	-2.65
Turkey	1.28	-28.19	-77.67	0.20	2.29	42.34	262.53	-0.62
United Arab Emirates	1.14	-10.79	-31.57	0.07	2.67	36.41	228.26	-0.01
Mean	1.27	-17.01	-59.56	0.57	3.82	56.27	705.77	2.00
Max	1.75	-1.62	-4.30	3.28	6.63	97.51	1915.33	12.04
Min	0.79	-56.44	-218.23	-0.25	2.11	25.45	178.30	-2.65
Std. Dev.	0.25	11.26	51.00	0.74	1.29	18.38	449.21	3.13
Coff. of variation	0.19	-0.66	-0.86	1.29	0.34	0.33	0.64	1.57

Notes: Reported estimates are the averages on all phases over the sample period. Duration is calculated as the average of all phases (recession or expansion) over the sample. Amplitude and excess are in terms of percentage changes, and cumulation is calculated as the percent of GDP in first year of the phase.

Table 1. *Business Cycle Statistics for Period: 1960-2012*

Country	*Recession (peak-to-trough)*				*Expansion (trough-to-peak)*			
	Duration	Amplitude	Cumulation	Excess	Duration	Amplitude	Cumulation	Excess
Algeria	0.63	-3.86	-4.67	0.22	4.25	49.48	402.95	-1.04
Bahrain	1.50	-15.51	-49.76	1.03	6.63	52.02	1039.84	2.85
Bangladesh	1.67	-52.28	-150.03	2.05	3.63	108.17	807.60	1.20
Egypt	1.00	-10.71	-25.50	0.10	4.85	55.03	658.44	0.70
Iran	1.13	-34.07	-96.42	0.16	8.00	107.04	1612.78	-3.12
Iraq	0.50	-3.16	-2.26	0.45	4.50	53.62	435.95	-3.17
Israel	1.00	-11.42	-25.68	0.15	3.45	52.21	462.73	2.31
Kuwait	1.15	-20.48	-60.06	1.21	2.11	47.76	307.59	3.38
Lebanon	1.75	-1.85	-6.67	-0.03	4.00	25.45	178.30	-1.58
Libya	1.19	-14.02	-43.31	-0.35	1.67	38.61	185.11	1.40
Malta	2.25	-9.16	-53.36	0.34	8.38	110.34	2203.79	-7.87
Mauritania	0.81	-4.11	-6.97	0.21	4.50	53.27	721.22	3.27
Morocco	1.58	-18.65	-68.57	0.46	7.38	98.37	2241.11	-8.08
Oman	0.67	-13.53	-13.51	2.21	5.25	207.08	2825.81	37.53
Pakistan	1.63	-33.48	-101.25	4.48	5.13	87.82	1734.22	7.99
Qatar	1.17	-19.34	-53.71	1.20	2.92	104.61	765.18	6.95
Saudi Arabia	0.63	-15.20	-15.02	1.51	3.88	164.21	1255.93	11.45
Sudan	1.25	-16.30	-39.68	0.35	1.50	29.56	99.88	1.86
Syria	0.69	-7.83	-10.58	0.57	3.94	69.73	671.49	3.79
Tunisia	1.42	-6.08	-20.51	-0.19	8.25	111.91	2894.91	-7.73
Turkey	1.75	-41.37	-125.82	0.55	1.88	56.32	305.70	2.76
United Arab Emirates	1.50	-13.93	-51.48	-0.25	2.25	40.74	302.28	3.29
Mean	1.22	-16.65	-46.58	0.75	4.47	78.33	1005.13	2.64
Max	2.25	-1.85	-2.26	4.48	8.38	207.08	2894.91	37.53

Min	0.50	-52.28	-150.03	-0.35	1.50	25.45	99.88	-8.08
Std. Dev.	0.46	13.00	40.90	1.09	2.13	45.06	868.78	9.22
Coff. of variation	0.38	-0.78	-0.88	1.45	0.48	0.58	0.86	3.49
Notes: See notes to Table 1.								

Table 2. *Business Cycle Statistics for Period: 1960-1985*

Country	*Recession (peak-to-trough)*				*Expansion (trough-to-peak)*			
	Duration	Amplitude	Cumulation	Excess	Duration	Amplitude	Cumulation	Excess
Algeria	1.50	-17.67	-64.20	-0.44	1.75	16.94	72.16	1.31
Bahrain	0.88	-3.39	-7.42	-0.44	2.25	28.05	118.28	-0.88
Bangladesh	0.88	-0.94	-1.82	0.03	7.00	41.29	719.70	4.95
Egypt	2.00	-21.72	-95.04	-0.06	5.50	64.30	1118.96	3.81
Iran	1.14	-25.92	-77.55	0.60	1.33	20.29	82.98	0.03
Iraq	1.00	-17.30	-40.27	0.42	1.33	18.04	55.43	1.14
Israel	1.06	-4.99	-13.55	0.15	3.25	35.97	322.82	3.07
Kuwait	1.31	-35.08	-93.34	2.58	2.92	59.98	678.25	8.10
Lebanon	1.25	-1.62	-4.30	0.01	4.00	25.45	178.30	-1.58
Libya	2.17	-37.74	-146.66	2.69	3.17	34.00	299.56	1.62
Malta	1.08	-6.02	-13.35	0.16	2.88	24.82	127.87	-0.29
Mauritania	1.42	-17.92	-49.49	0.05	1.88	9.61	80.05	1.81
Morocco	1.25	-11.41	-27.33	0.43	2.25	29.34	138.81	0.14
Oman	0.81	-6.70	-13.89	-0.08	2.94	33.04	191.33	-1.40
Pakistan	1.00	-3.23	-6.57	0.21	1.94	18.06	98.54	0.60
Qatar	1.00	-9.86	-22.06	-0.52	2.75	41.37	219.46	-2.07
Saudi Arabia	1.25	-8.51	-22.01	-0.15	3.75	34.10	240.36	-2.03
Sudan	1.92	-83.20	-337.27	5.23	3.13	87.70	996.35	11.53
Syria	1.00	-19.71	-47.32	0.37	1.63	20.11	91.26	2.23
Tunisia	1.00	-6.78	-14.20	0.02	2.75	30.30	191.36	0.22
Turkey	1.00	-20.28	-48.79	-0.01	1.44	22.02	59.07	-0.04
United Arab Emirates	0.88	-4.49	-9.02	-0.05	2.88	34.25	191.25	-1.66
Mean	1.22	-16.57	-52.52	0.51	2.85	33.14	285.10	1.39
Max	2.17	-0.94	-1.82	5.23	7.00	87.70	1118.96	11.53
Min	0.81	-83.20	-337.27	-0.52	1.33	9.61	55.43	-2.07
Std. Dev.	0.38	18.14	73.62	1.33	1.35	17.89	306.19	3.35
Coff. of variation	0.31	-1.10	-1.40	2.62	0.48	0.54	1.07	2.41
Notes: See notes to Table 1								

Table 3. *Business Cycle Statistics for Period: 1986-2012*

In terms of amplitude, cumulation, and excess we observe even higher differences across countries as seen from (Figure 2, 3, and 4). First of all, these loss measures are much larger than those observed in industrialized countries, when compared with the estimates in Harding and Pagan (2001). The recessions and expansions in MENA countries are deeper than those in industrialized countries, although their durations are comparable. There are countries with tremendous losses occurring. The average cumulation in Sudan reaches an average of -218.23 percent for recessions. Even the amplitude for a recession in Sudan reaches an extreme level of -56.44. The gains as measured by amplitude (Figure 2) and cumulation (Figure 3) are less variable than losses. However, the excess gain is more variable than excess loss across countries (see Figure 4). This points out that the bias in cumulation is more likely to be larger for expansion phases. The cumulation ranges from 178.30 percent (Lebanon) to 1915.33 percent (Algeria). Further, we note that the countries with large losses during recessions do not have large gains during expansions. The coefficients of variation point out that excess vary more than amplitude and cumulation across the countries.

Business cycle characteristics for the sub-samples 1960-1985 and 1986-2012 are given in Table 2 and Table 3, respectively. A general implication from these sub-sample estimates is that the large differences among the countries are preserved in both sub-samples as in the full sample. However, the 1986-2012 period is more volatile than the 1960-1985 period except the duration, which seems equally varying across the countries in both sub-samples. Although the duration of recessions are 1.22 years in both sub-sample the duration of expansions is much shorter in the 1986-2006 period (2.85 years in the 1986-2012 period and 4.47 years in the 1960-1985 period). The coefficients of variation indicate that in general the variability is about 50 percent higher in the 1986-2012 period.

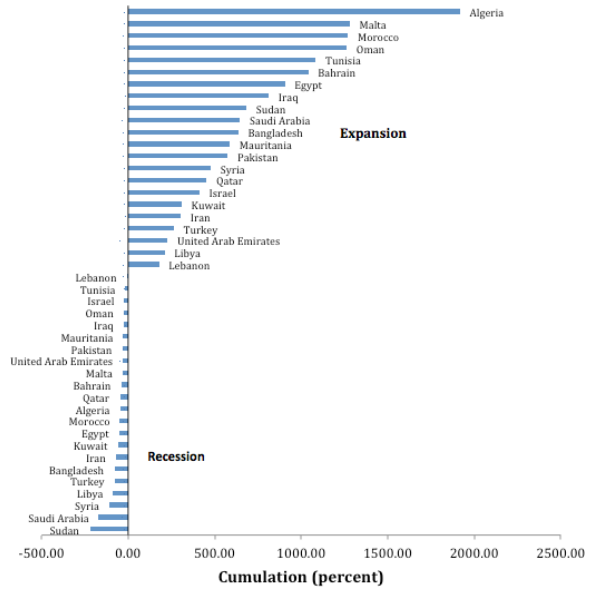

Figure 3. *Cumulation during Expansions and Recessions (Percentage of GDP in first year of phase)*

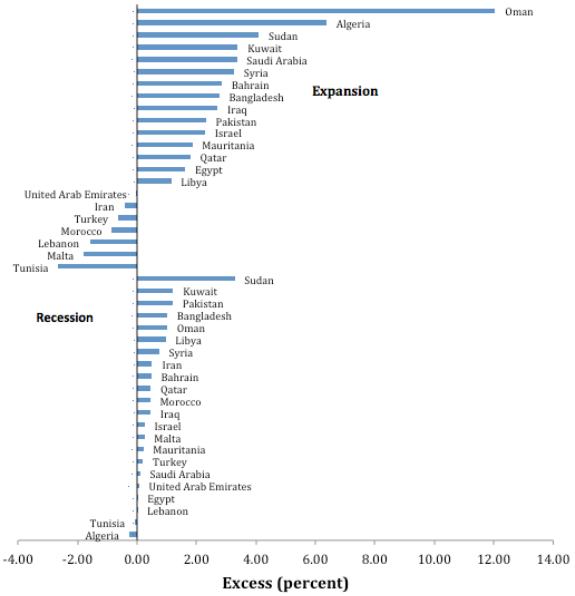

Figure 4. *Business Cycle Excess during Expansions and Recessions (Percentage of GDP in first year of phase)*

4 Conclusion

In this paper, we provided a compressive analysis of business cycle characteristics across a large set of countries in the MENA region. We estimate several numerical measures of their business cycle characteristics. These measures offer a complete description of the cycle. In doing so, we avoided any a priori assumption about the existence of certain business cycle characteristics. The paper also does not assume existence of any common business cycle across some or all countries of the region. We also did not use any parametric model to describe the business cycle movements of individual countries and comovements between pairs (or groups) of countries. These parametric models are extensively used to analyze the business cycle synchronization of major industrialized countries. The results from these models are by now are mixed, inconclusive, and sensitive to various parameterizations. None of the filter-based business cycle synchronizations measures are used either, since the results obtained from this approach are shown to depend on the particular filter used. We adopt robust statistical methods from other scientific disciplines in order to investigate whether some countries can be classified into the same group in terms of their business cycle characteristics. We used multidimensional scaling and cluster analysis to shed some light on the question about the existence of a cycle that might be representative of the MENA region.

Our results bring a different lesson to the previous research that assumed existence of some kind of a common cycle across the MENA region countries. These papers usually attributed this common cycle to increased trade links and/or to similar economic structures. Using the robust classification methods we fail to classify MENA countries into groups based on their business cycle characteristics. We are not able to obtain convincing evidence that there is a common reference cycle for all or groups of countries in the MENA region either. Our findings suggest that the results of those papers assuming a common cycle should be reconsidered.

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