Trade integration and business cycle synchronization: evidence from the experience of Arab countries[1]

by

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Abstract

This paper revisits the empirical relationship between trade integration and business cycle synchronization, using panel data covering the entire world over the period 1995–2013 and a battery of alternative bilateral trade integration measures. Estimation results suggest that greater trade integration is associated with more synchronized business cycles. This result is fairly robust and holds up when possible endogeneity issues are taken into account. Among trade integration indicators considered, the bilateral trade intensity indicator exhibits a more robust relationship with the business cycle synchronization variable. The trade integration and business cycle synchronization relationship for Arab countries, however, is different from the full sample. The direction of the relationship is in fact the opposite. That is, greater trade integration among Arab country pairs is associated with less synchronized business cycles.

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1. Introduction

Economies around the world move increasingly together and this has been even more apparent during the peak of the global financial crisis. Over the period 2007-2009, output co-movements, as measured by GDP growth rate and de-trended output correlations, were considerably synchronized, regardless of income levels or geographic regions (Abiad et al., 2013). The high degrees of output co-movement have taken place mostly against a background of fast growing trade and financial integration of the world economy. World trade growth has outstripped world output growth in the great majority of the years since the 1960s, with the cumulative increase in trade volumes having been more than triple that of world output growth. There also had been a surge in global financial flows since the 1980s (Kose et al., 2003).

In this paper we revisit the question that to what extent intensifying trade linkages lead to greater business cycle synchronization across countries, with a specific focus on the Arab region. There is an extensive literature on the subject, more recent examples of which include Duval et al. (2014) and Abiad et al. (2013). While we draw on the existing literature, this study also extends earlier studies by covering all the economies around the world for which data are available over the period 1995-2013 and by relying on a recently proposed business cycle synchronization measure, which is argued to be superior to the measures that are based on simple correlation of the cyclical component of a preferred output measure-GDP or the industrial production index.

We also calculate and employ a number of different trade integration and specialization measures to capture possible channels through which international trade linkages may affect business cycles across countries. International trade linkages play an important role in transmitting not only demand spillovers but also supply shocks across countries. For instance, a consumption or investment boom in a country could generate increased demand for imports and stronger trade linkages facilitate the propagation of the initial demand shock to its trading partners. The trade intensity index, as measured by the ratio of the total bilateral trade to combined GDPs for a given country pair, and the trade complementarity index are deemed to provide reasonable proxies to assess this channel. Also, sectoral productivity shocks are transmitted to the trading partners of a country to the extent their production networks are closely linked. In order to better capture such mechanisms, this study also considers the intra-industry trade, export concentration and trade specialization correlation indices in the econometric model specifications.

This study pays particular attention to the Arab region, with a view to answering the question of whether Arab countries differ significantly in terms of the effect of their trade linkages on the extent of business cycle synchronization from all other remaining country pairs is explored. In view of the fact that South Mediterranean Arab countries tend to have closer and stronger trade links with their European counterparts, whether the nature of the link is different between Arab-European country pairs than the rest is also looked into.

Estimation results using panel data methods indicate that greater trade integration is associated with more synchronized business cycles. This result is robust and holds up when possible endogeneity issues are taken into account. Among trade integration indicators considered, the bilateral trade intensity indicator exhibits a more robust relationship with the business cycle synchronization variable.

The direction of the relationship between trade intensity and business synchronization among Arab country pairs, however, is the opposite. In fact, greater trade integration among Arab country pairs is linked with less synchronized business cycles. This is an interesting results which require further analysis on as to what factors drive this difference.

The remainder of the paper is organized as follows. Section 2 presents some stylized facts about trade links among Arab countries and between Arab countries and the rest of the world. The methodology is provided in the third section. Section 4 describes the data used in the empirical analysis. Section 5 discusses the results before Section 6 concludes.

2. Trade integration in the Arab region

2.1. Trade integration initiatives in region

Arab countries are parties to a number of preferential trade agreements, including sub-regional agreements between neighboring countries, a region-wide FTA, as well as bilateral arrangements with third parties. Most of of these agreements aimed at fostering pan-Arab economic integration and creating a bloc that can compete in global markets, with a view to capitalizing on the resources and endowments of Arab countries. In this regard, Arab integration efforts also deal with pooling product, labor and capital markets to leverage the region's resources.

Of the 18 PAFTA countries, 13 are members of the WTO, and four of the remaining countries hold an observer status (WTO 2015). A number of bilateral trade agreements exist between individual Arab countries and third parties and regions. These have shaped and strengthened Arab countries' economic connections with non-Arab countries. The formation of the ACU and linking of Arab economies with Africa will have implications for these third-party agreements.

The EU has completed or is still negotiating regional agreements with many Arab states through the Euro-Med Partnership Agreement, the EU-GCC FTA, and other bilateral agreements. The former, first signed in 1995, is planned to link the EU with the non-EU countries along the Southern Mediterranean countries, including a number of PAFTA countries[4]. Economic negotiations with the GCC have been under way since the 1980s, but have stalled since 2008, short of creating an FTA (European Commission, 2014). Bilateral trade agreements involve direct EU

[4] Algeria, Egypt, Lebanon, Libya, Morocco, Palestine, Syria and Tunisia.

negotiations with several additional PAFTA members, including association agreements and FTAs. Many of these countries will also be covered under Euro-Med. EU-Arab cooperation and agreements have further fostered high EU-Arab trade, although much of this involves European manufactured exports to the Arab region and fuels exports to the EU; indeed, the EU is the largest trading partner for the majority of PAFTA members, including the GCC.

Rather than pursuing regional agreements with the Arab world, the United States maintains several bilateral trade relationships with Arab countries in the context of the New Middle East Initiative[5]. These hold both economic and political purposes. Many Arab countries have signed bilateral trade agreements with Turkey, including Palestine, Tunisia, Morocco, Syria, Egypt, Libya and Lebanon, and further negotiations are ongoing with other PAFTA members (Ersoy, 2013).

As far as Arab economic integration initiatives are concerned, their origins were established with the 1981 LAS Agreement on Trade Flow Facilitation and Development, which set the groundwork for the proliferation of bilateral RTAs, and for the Pan-Arab FTA (IDIA, 2007). Accordingly, PAFTA was initially signed in 1997 between 14 countries, growing to 18 today. Tariff cuts were implemented by 2005 and covered a variety of sectors ranging from agriculture to manufacturing, but many exemptions were initially allowed on a country-by-country basis under the agreement. These exemptions have been gradually lifted over time and all goods are tariff-free under PAFTA arrangements, but a multitude of restrictive NTMs, and the exclusion of services, are still key concerns when conducting trade between PAFTA members (ESCWA 2015). Due to these persisting issues, intra-Arab trade has been stagnating, never reaching more than 11.5 per cent of the region's total trade over the period 2000-2013, far below the peak of 55.9 per cent in the EU and 23 per cent in ASEAN (ESCWA 2015). Other issues that hinder the full implementation of PAFTA include low diversification of the region's economies, persisting NTMs, insufficient transport, lack of extension of the agreement to services, and poor economic governance and institutions, amongst other causes (ESCWA 2015; Arab-EU Quarterly, 2015).

Negotiations have been initiated to advance integration beyond PAFTA and towards the ACU. The ACU was intended to be launched in 2015 but, following a renewed round of negotiations, a new roadmap has been endorsed by LAS and Arab Leaders during their March 2015 summit in Egypt, which calls for a more gradual process based on the examination of country-level implications of the ACU and the preparation of studies based on this for a potential launching of the ACU in 2017. As a tighter form of integration, it is envisaged that the ACU will help close many of the loopholes that persist under PAFTA and will move the region closer towards economic integration. Indeed, amongst other issues, addressing trade-restrictive NTBs will be a central tenet of the ACU, as well as greater harmonization of fiscal conditions,

[5] Countries include Bahrain, Jordan, Morocco, and Oman, amongst others.

competition policies, and external trade relations through a common trade policy, of which a CET will be central tool.

The bulk of integration and trade deals which predated PAFTA were composed of sub-regional agreements. The first of these involved the Gulf Cooperation Council (GCC), formed in 1981 by Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and the UAE. The GCC – originally an economic agreement centering on trade policy integration – has progressed over the years to move further towards a common market and customs union, established in 2003. This customs union is the strongest economic integration agreement existing within the Arab region despite some shortcomings which limit its efficiency (such as unilateral FTAs signed with other countries, nonexistent systems of collection and distribution of duties on imports, and other issues).

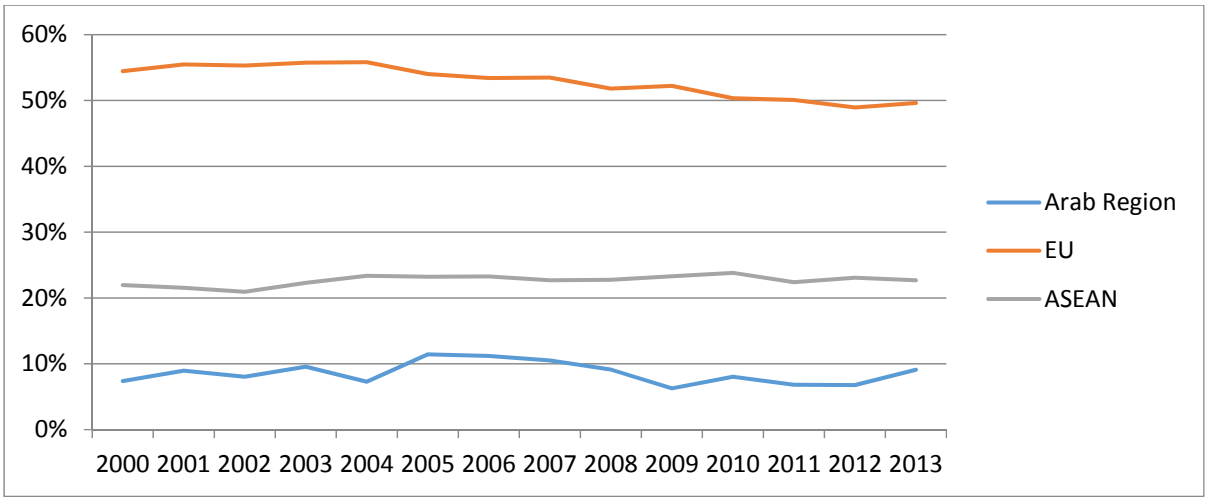
The Arab Maghreb Union (AMU), formed in 1989 between Algeria, Libya, Mauritania, Morocco and Tunisia, was meant to foster trade and overall cooperation amongst its member states. Yet integration amongst member countries varies greatly, with some being well connected within the sub-region and others being relatively isolated and having far more significant links with the EU than with Arab partners. In fact the AMU features the lowest share of intra-Arab trade of any sub-region (ESCWA 2015). In general, implementation of AMU initiatives has faced many challenges and has been slow (Arab-EU Quarterly 2015). An additional agreement, the Agadir Agreement of 2004 between Egypt, Jordan, Morocco and Tunisia, established an FTA which was a part of the greater Euro-Med process.

More recently, a Tripartite agreement linking three sub-regions of Africa has been signed in July 2015. Among the 23 signatory member countries, three of them (Libya, Sudan and Egypt) are already members of PAFTA. The initial TFTA involves eliminating tariffs and NTBs, and does allow for different paces of adoption based on country characteristics.

2.2. Trade patterns

Trends in regional Arab trade since 2000 indicate that, despite a slight increase in the role of regional trade flows, Arab countries still trade less amongst themselves than do other countries members into regional trade blocks such as the EU and ASEAN (Figure 1). It is notable that from 2005-2008, directly following the formal implementation of PAFTA, intra-Arab trade volumes increased by 76 per cent, and in fact intra-Arab trade as a percentage of total trade reached a high of 11.5 per cent in 2005.

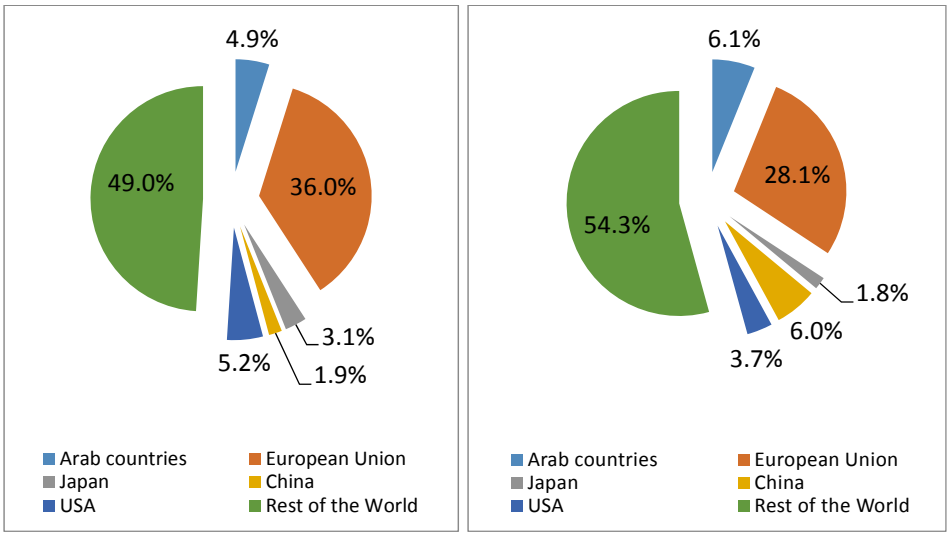
Figure 1: Intra-Arab trade compared with the EU and ASEAN (% of total trade)



Source: Authors' calculations based on BACI World Trade Database

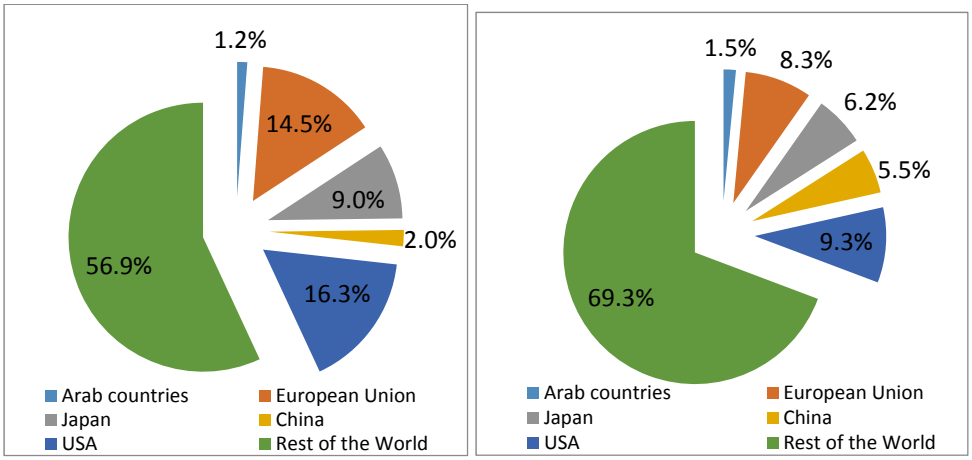
Turning to the trade relationships with the rest of the world, the EU is the largest exporter to the Arab region despite its decreasing share from 36% in 2000 to 28.1% in 2013 followed by China which supplied the region with 6% of its imports in 2013 compared with only 1.9% in 2000. Similarly to the EU, the share of Japan and the USA in the Arab markets experienced a decline from 5.2% and 3.1% respectively in 2000 to only 3.7% and 1.8% in 2013 (Figure 2). Even on exports, the distribution by destination followed the same tendencies as imports (Figure 3).

Figure 2: Origins of Arab Imports (2000-2013)



Source: authors' calculations based on BACI World Trade Database

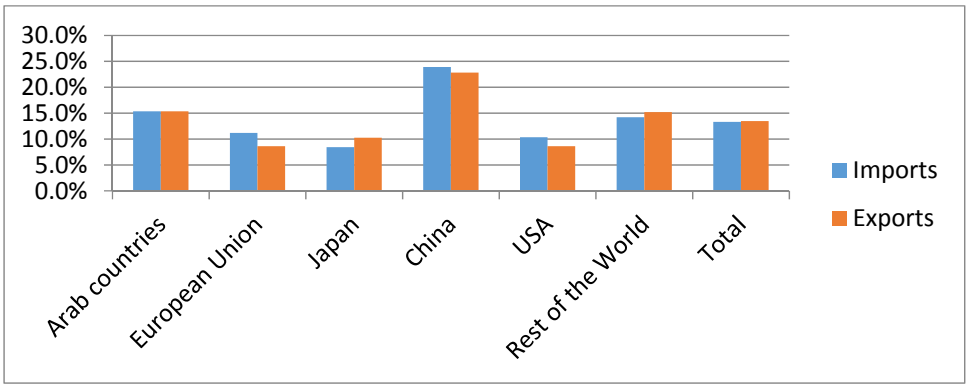
Figure 3: Destination of Arab exports (2000-2013)



Source: authors' calculations based on BACI World Trade Database

Examining growth rates of trade flows show that trade with China experienced the highest growth rates over the period 2000-2013 for both imports and exports followed by Arab countries, and the rest of the world (excluding China, Japan, USA, EU, and Arab countries). However, it is worth noting that imports from most major partners still growing at highest rates than exports. This is the case of trade with China, USA, and the EU. However, imports from Japan and the rest of the world are growing at lowest rates than exports (Figure 4).

Figure 4: Arab trade growth rates by origin and destination (2000, 2013)



Source: authors' calculations based on BACI World Trade Database

3. Methodology

While the issue has been subject to a number of recent studies, earlier work in the optimum currency area literature in particular pays close attention to the role of trade linkages in output co-movements. The extent of trade integration among potential members and symmetry of their business cycles feature among key optimal currency area (OCA) criteria. Larger trade and investment flows lead to greater benefits from reduced transaction costs ensuing the adoption of a common currency and helps compensate member countries for the loss of independent monetary policy. The OCA literature has moved away from treating trade integration and business cycle synchronization as exogenous criteria, arguing that trade and financial integration and output co-movements are endogenous (Frankel and Rose, 1997 and 1998).

Economic theory suggests that the direction of the trade integration and output co-movement relationship is ambiguous, with the sign depending largely on the dominant channel and the nature of the trade linkage. For instance, if the demand channel drives business cycle, a positive output shock in a given country is likely to boost demand for foreign goods and, depending on the strength of trade linkages, the trading partners of the country in question would experience a pick-up in economic activity and tend to exhibit more correlated business cycles. If business cycles are driven mainly by industry-specific shocks and trade linkages are based on inter-industry exchange, specialization in production would lead to business cycles moving in opposing directions, all else being equal. Specialization, however, does not necessarily lead to a negative relationship between greater trade integration and business cycle synchronization. If intra-industry, as opposed to inter-industry, trade defines trade patterns between two countries, industry-specific shocks may or may not generate divergence in economic activity in the two countries as specialization takes place mainly within industries. The lack of an unambiguous theoretical prediction on the relationship between trade integration and business cycle synchronization indicates that this is ultimately an empirical question, the answer to which also crucially depends on the pattern of trade and specialization among different country pairs.

Kalemli-Ozcan et al. (2001) suggest that there may be another mechanism at work, making for a negative relationship between trade integration and business cycle synchronization. Owing to highly integrated international goods and financial markets, individual countries are better able to hedge against adverse shocks and can diversify income, allowing them to have more specialized production structures. This in turn tends to lead to more asymmetric business cycles, despite strengthening trade and financial linkages. Frankel and Rose (1998) focus on the channel that greater trade and financial linkages may lead to more coordinated policy shocks and in turn more symmetric business cycles. Trade integration may also facilitate the spread of productivity shocks through diffusion of technology (Coe and Helpman, 1995) or FDI and technology sourcing (Lichtenberg and Pottelsberghe, 1998).

There is an extensive literature on the empirical assessment of the trade integration and business cycle synchronization nexus. A number of studies that focus on industrial countries find evidence that stronger trade linkages are associated with higher business cycle synchronization (Frankel and Rose, 1997, 1998; Fatas, 1997; Clark and van Wincoop, 2001). Calderon et al. (2003) extend such studies to analyze developing as well as industrial countries, not only confirming the finding that greater trade integration leads to higher business cycle synchronization but also concluding that this relationship is significantly stronger among industrial country pairs than developing or mixed (industrial-developing) country pairs.

The main objective of this paper is to explore the impact of trade integration on business cycle synchronization (BCS) using a large panel of countries and capturing different aspects trade linkages, with a specific focus on the Arab region. In particular, the issues of whether trade integration among Arab countries has a differential impact on their business cycles as compared

to other country pairs in the rest of the world. An analogous approach is taken to explore whether the BCS effects of trade linkages between a pair of Arab and European countries differ systematically from all other country pairs are also empirically scrutinized.

The estimation strategy followed in this paper is based on panel regressions with fixed effects. This in essence allows us to condition on common global shocks, by controlling for time fixed effects that vary across time and common across all countries, and country-pair specific factors, by including time-invariant country-pair specific fixed effects that accounts for country-pair specific factors such as gravity-type variables and unobservable idiosyncratic factors.

The baseline model takes the form:

$$BCS_{ijt} = f\left(Trade_{ijt-1}\right) + \alpha_{ij} + \alpha_t + \varepsilon_{ijt}$$

where BCS_{ijt} is the instantaneous business cycle synchronization measure between country pair *i-j* at time period *t*, α_{ij} is the time-invariant country-pair fixed effect, $\alpha_t$is the time-fixed effect, and Trade_{ijt-1} capture one-period lagged trade integration measures that include trade intensity and specialization indicators, as defined and calculated below.

As BCS might be driven by omitted and unobservable factors that might also be correlated with trade and there might be reverse causality concerns that countries with more synchronized business cycles tend to engage in more bilateral trade, possible endogeneity issues need to be addressed. In the panel data analyses carried out, as Duval et al. (2014) argue, controlling for time-invariant factors mitigate possible endogeneity problems and the use of lagged rather than instantaneous trade integration measures help alleviate reverse causality issues. Possible endogeneity issues are also addressed in this study, following the literature on the topic, by adopting the instrumental variable approach. This approach is mainly due to Frankel and Rose (1998) and most subsequent studies on the topic, which utilize gravity variables including distance, common border and language dummies, to identify the effect of trade integration on business cycle synchronization. Select gravity variables are used as instruments in the current study, namely a WTO membership dummy, the product of the pair's real GDPs, and a dummy for contiguity. Nevertheless, Gruben et al. (2002) argue that gravity variables are not appropriate instruments as those variables do not only influence trade integration but also other factors that impinge on business cycle synchronization. For example, geographically contiguous countries are more likely to participate in common currency arrangements and coordinate their monetary and fiscal policies, which in turn affects the convergence of their business cycles. Shin and Wang (2003) indicate that gravity variables are expected to be highly correlated with trade intensity measures, but not necessarily intra-industry trade indices. They also claim that they are poor instruments in a panel regression setting as gravity variables are constant across time. Inklar et al. (2008) deal with possible endogeneity issues by estimating a multivariate model including policy variables,

ultimately finding that even though trade integration and business cycle synchronization are robustly and positively associated, the effect is smaller than previous studies had suggested.

To assess whether the relationship between BCS and trade integration differ systematically in the Arab region, a dummy variable indicating that both countries in a country pair are from the Arab region and the interactions of this dummy variable with trade integration measures are included in the model. In order to scrutinize whether deeper trade integration of Arab countries with their European counterparts lead to greater business cycle conversation than trade among Arab country pairs, an addition dummy is introduced and included in the set of specifications estimated.

While the theoretical concepts in the context of business cycle synchronization and trade integration are relatively straightforward, how to capture and measure them adequately are less clear and often involves a degree of discretion. For instance, what output measure to use and how to de-trend it are not guided by theory. Also, there are several trade integration and specialization measures that are suggested in the literature and extensively used in exploring the relationship.

Different measures of economic activity are used in the literature to obtain a business cycle synchronization measure. GDP, which covers the entire economy and is therefore a comprehensive measure of economic activity, and the index of industrial production, which is often limited to the manufacturing sector but tends to be available at a monthly frequency for a long period of time, are the most common choices. The preferred measure of business cycle synchronization is generally correlation between the de-trended measures of economic activity (following Frankel and Rose, 1997 and 1998). Bayoumi and Eichengreen (1997, 1998) have developed an alternative measure of business cycle correlation, differently from the correlation between the cyclical components of output in a given pair of countries. Their indicator of business cycle asymmetries is the standard deviation, calculated over a pre-determined time period, of the change in the ratio of output levels in log terms for a given country pair. Lower of values of this business asymmetry index indicate a higher degree of business cycle synchronization.

An additional layer of uncertainty is introduced by the need to select an appropriate method to filter original output series. For instance, the Hodrick-Prescott (HP) filter is one of the commonly methods. The HP filter in essence removes fluctuations in a series with a frequency of more than a pre-determined period. Alternatively, the band-pass (BP) filter of Baxter and King (1999) is used to further remove fluctuations with frequencies above a certain threshold. Fortunately, alternative filtering methods seems to deliver similar output co-movement measures and the choice of the filtering method reportedly matters little and is not crucial to the conclusions drawn (Artis and Zhang, 1997; Calderon et al., 2002; Massmann and Mitchell, 2004).

Apart from suffering from the use of arbitrary filtering methods to de-trend output, bilateral correlations of de-trended output measures and the business cycle asymmetry measure of Bayoumi

and Eichengreen have some shortcomings. Typically, the Pearson correlation coefficient is calculated using actual or de-trended growth rates between a country pair over a window period. Alternatively, the rolling Pearson correlation is calculated to measure output co-movement between two economies at every point in time but this artificially introduces autocorrelation to the BCS time series due to a high degree of overlapping observations throughout the sample. Another downside of the bilateral correlations measure of de-trended output is that it is necessarily bounded between -1 and 1. It is argued that, if the BCS measure lies between -1 and 1, the error terms in the regression explaining it are unlikely to be normally distributed and regression analysis using this measure would not allow reliable statistical inference (Inklar et al., 2008)[6].

In this paper, the preferred business cycle synchronization measure is the instantaneous quasi-correlation measure proposed by Abiad et al. (2013). The quasi-correlation of real GDP growth rates between countries *i* and *j* at time *t* is defined as:

$$qcorr_{ijt} = \frac{(g_{it} - g_i^*)(g_{jt} - g_j^*)}{\sigma_i^g * \sigma_j^g}$$

where g_{it} (g_{jt}) represents the real GDP growth rate of country i (j) in year t, and $g_i^*(g_j^*)$ and σ_i^g (σ_j^g) stand for the mean and standard deviation of output growth rate of country *i(j)*, respectively, during the sample period.

This measure has been used by more recent studies, including 1 Duval et al. (2014), and offer several advantages over alternatives, not suffering from their shortcomings mentioned above. In particular, this BCS measure enables the calculation of the extent of output co-movement at every point in time rather than over an interval of time. Growth quasi-correlations have also been shown to exhibit useful statistical properties. The period mean of this measure would asymptotically converge to the standard Pearson correlation coefficient. Also, it is not bounded between -1 and 1, making it appropriate to use in regression analyses.

Capturing the strength of trade linkages entails measuring different aspects of trade integration between different country pairs. The impact of trade flows on business cycle synchronization depends not only on trade volumes but also the structure of trade. For instance, if business cycles are dominated by industry-specific shocks, then specialization brought about trade linkages reduces output co-movement as briefly explained above. By contrast if intra-industry trade is significant, industry-specific shocks would lead to more synchronized business cycles. In view of the need to capture different aspects of trade linkages, the following indices are calculated and included in the analysis presented in this paper: Trade intensity, Export concentration index,

[6] Inklar et al. (2008) transform Pearson correlation coefficients and use them as the dependent variable in their regression analysis. More specifically, they use Fisher's z-transformation of pair-wise correlation coefficients to ensure that the transformed correlation coefficients are closer to being normally distributed.

Intra-Industry trade index, and Trade complementarity index. Appendix 2 defines the feature of each index and the methodology of their estimation.

4. Data and descriptive statistics

The empirical analysis in this paper relies on an annual dataset, covering the entire world over the period 1995-2013 to the extent that bilateral merchandise trade and economic activity data are available. Real GDP data are extracted from the World Development Indicators (WDI) database and go as far back as 1960, covering 214 countries over the period 1960-2013. Different country groups, or blocs, are then created using these data. The aggregation of GDP for the blocs considered in this study are done based on constant price GDP figures in US dollars of the countries belonging to the bloc in question.

Data on bilateral merchandise trade flows at a high level of product disaggregation, more specifically at the HS 6-digit level, are obtained from BACI's World trade database, developed by the CEPII. The database include data on over 200 countries since 1995, up to 2013. The dataset includes adjustments to the data reported to the United Nations Statistics division by converting import values expressed in CIF terms into FOB values and accounting for the reliability of country reporting to match reported trade flows. Bilateral trade integration indices presented above are calculated based on these improved data on bilateral trade flows.

While bilateral trade flows data are available at the HS 6-digit level, the granularity of the actual data used to calculate the trade indices is dictated by computational requirements. In particular, the trade complementarity and specialization correlation indices are calculated using Standard International Trade Classification (Rev.4) at the 5-digit level[7]. Fortunately, the choice of the classification and level of disaggregation has little or no impact on the ultimate regression results.

Bilateral output correlations and different trade integration indices exhibit some variation across time and country pairs (Table 1). Differences between Arab-Arab country pairs and the rest are particularly noticeable in the case of growth quasi-correlations and the trade intensity indicator. The business cycle synchronization measure, growth quasi-correlations, range between -12.15 and 20.15, with a standard deviation of 0.88 and mean of 0.12. Growth quasi-correlations show considerably less variation among Arab-Arab country pairs with a mean of a mean of 0.5, which is less than half of what is estimated for the rest of the world.

Trade intensity indicator has a mean of 0.06 and attains the maximum 16.8 across all country pairs. Somewhat surprisingly the mean of this indicator is 0.13 across Arab-Arab country

[7] The correspondence tables to convert the HS 6-digit level to different classifications and levels of detail are from the WITS and accessed at http://wits.worldbank.org/product_concordance.html.

pairs, despite the fact that it varies in a smaller rage, between 0 and 2.4. Other trade specialization indices, however, show to a large extent similar distributions.

The cross-correlations of trade intensity and specialization indices however are largely in line between Arab-Arab country pairs and country pairs with at least one non-Arab partner (Table 2). The cross correlations suggest that country pairs that trade intensely tend to have intra-industry trade constituting an important part of their bilateral merchandise trade. This appears to be the case among Arab-Arab country pairs, as well. Low cross-correlations indicate that multi-collinearity problems are not likely to be an issue in panel regression analysis carried out in this study.

Table 1: Growth quasi-correlations and trade indices summary statistics

	growth quasi-correlation	trade intensity index	export concentration index	intra-industry trade index	trade specialization correlation index	trade complementarity index
Country pairs with at least one non-Arab partner						
mean	0.12	0.06	0.32	0.02	-0.04	0.37
median	0.02	0.00	0.26	0.00	-0.03	0.36
sd	0.88	0.28	0.27	0.06	0.08	0.11
min	-12.15	0.00	0.00	0.00	-0.99	0.05
max	20.15	16.81	1.00	1.00	0.34	0.99
Arab country pairs						
mean	0.05	0.13	0.34	0.02	-0.02	0.35
median	0.00	0.04	0.28	0.00	-0.02	0.33
sd	0.61	0.24	0.25	0.05	0.08	0.14
min	-5.02	0.00	0.00	0.00	-0.79	0.04
max	9.25	2.37	1.00	0.66	0.31	0.97

Table 2: The correlation matrix of trade and specialization indices

Panel A: Arab country pairs	(obs=5102)					
		trade intensity index	export concentration index	intra-industry trade index	trade specialization correlation index	trade complementarity index
trade intensity index		1.00				
export concentration index		-0.03	1.00			
intra-industry trade index		0.42	-0.06	1.00		
trade specialization correlation index		-0.21	0.12	-0.19	1.00	
trade complementarity index		-0.14	-0.01	-0.16	-0.03	1.00

Panel B: Country pairs with at least one	(obs=375131)					
		trade intensity index	export concentration index	intra-industry trade index	trade specialization correlation index	trade complementarity index
trade intensity index		1.00				
export concentration index		-0.03	1.00			
intra-industry trade index		0.44	-0.06	1.00		
trade specialization correlation index		-0.06	-0.03	-0.06	1.00	
trade complementarity index		0.09	-0.19	0.12	-0.07	1.00

5. Estimation Results

The regression results indicate that there is a statistically significant and robust relationship between bilateral trade integration variables and the business cycle synchronization measure, growth quasi-correlations. In all specifications, bilateral trade integration variables are of the expected sign and statistically significant (Table 3). That is, bilateral trade intensity, export concentration, trade specialization and intra-industry indices are positively associated with the business cycle synchronization measure of growth quasi-correlation. Greater bilateral trade volumes, intra-industry trade, match between their exports and imports, and specialization in the exports of the same products are associated with greater co-movement of the outputs of a country pair. Higher values of export concentration index, however, is negatively associated with greater business cycle synchronization as expected but it is not statistically significant at conventional significance levels. The relationships appear to be fairly robust across different specifications, with the exception of the export concentration index.

The results by and large hold up when possible endogeneity issues are addressed (even numbered specifications in Table 3). For instance, when the bilateral trade intensity variable is instrumented by gravity-type variables, which include the product of real GDPs, physical distance, GATT/WTO membership dummies, and contiguity, and the relationship is estimated by two-stage

least squares, the bilateral trade intensity variable maintains its sign and significance. In fact, the instrumental variable estimate of the coefficient of bilateral trade intensity becomes economically much more significant.

Table 3: Business cycle synchronization and bilateral trade integration

Dependent variable: growth quasi-correlation	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
estimation method	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV
lagged trade intensity index	0.0763***	1.0656***	0.0714***	0.9069*	0.0764***	0.9069	0.0695***	1.1154***	0.0645***	1.0760***
	[0.016]	[0.178]	[0.016]	[0.520]	[0.016]	[1.821]	[0.017]	[0.348]	[0.017]	[0.245]
lagged intra industry trade index			0.1936***	2.6889	0.1944***	2.6889	0.2297***	dropped	0.2276***	dropped
			[0.035]	[8.269]	[0.035]	[38.392]	[0.038]		[0.038]	
lagged trade specialization correlation index					0.3358***	0	0.3813***	0.0837	0.3973***	0.1819
					[0.036]	[3.915]	[0.039]	[0.958]	[0.039]	[0.910]
lagged export concentration index							-0.0048	1.0193	-0.0038	dropped
							[0.008]	[3.769]	[0.008]	
lagged trade complementarity index									0.2153***	-0.3672
									[0.027]	[1.320]
Constant	0.0278***	-0.0115	0.0256***	-0.039	0.0349***	-0.039	0.0393***	-0.3298	-0.0416**	0.1298
	[0.007]	[0.010]	[0.007]	[0.085]	[0.007]	[0.522]	[0.008]	[1.190]	[0.013]	[0.496]
country-pair fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
time-fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Observations	374088	369586	374088	369586	374088	369586	342655	338674	342655	338674
R-squared	0.093		0.093		0.093		0.101		0.101	
Number of pair	27788	27038	27788	27038	27788	27038	27080	26368	27080	26368

Standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

Table 4: Differential impact of trade integration on business cycle synchronization in the Arab region

Dependent variable: growth quasi-correlation	(1)	(2)	(3)	(4)	(5)	(6)
lagged trade intensity	0.076***	0.082***	0.077***	0.082***	0.076***	0.071***
	[0.016]	[0.016]	[0.016]	[0.016]	[0.017]	[0.017]
lagged trade intensity*Arab pair dummy		-0.309***	-0.301**	-0.316***	-0.338***	-0.325***
		[0.120]	[0.121]	[0.121]	[0.124]	[0.124]
lagged intra industry trade index			0.196***	0.196***	0.233***	0.230***
			[0.035]	[0.035]	[0.038]	[0.038]
lagged intra industry trade index*Arab pair dummy			-0.227	-0.255	-0.283	-0.237
			[0.364]	[0.364]	[0.369]	[0.369]
lagged trade specialization correlation index				0.345***	0.388***	0.404***
				[0.036]	[0.039]	[0.039]
lagged trade specialization correlation index*Arab pair dummy				-0.639**	-0.52	-0.521
				[0.296]	[0.322]	[0.322]
lagged export concentration index					-0.006	-0.005
					[0.008]	[0.008]
lagged export concentration index*Arab pair dummy					0.084	0.077
					[0.071]	[0.071]
lagged trade complementarity index						0.209***
						[0.028]
lagged trade complementarity index*Arab pair dummy						0.116
						[0.126]
Constant	0.028***	0.028***	0.026***	0.035***	0.039***	-0.040***
	[0.007]	[0.007]	[0.007]	[0.007]	[0.008]	[0.013]
country-pair fixed effects	yes	yes	yes	yes	yes	yes
time-fixed effects	yes	yes	yes	yes	yes	yes
Observations	374088	374088	374088	374088	342655	342655
R-squared (within)	0.093	0.093	0.093	0.093	0.101	0.101
Number of pairs	27788	27788	27788	27788	27080	27080

Standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Intra-industry trade, trade specialization, export concentration and trade complementarity indices lose their significance in instrumental variable estimations as opposed to the bilateral trade intensity indicator (Table 3). The lack of robust causal relationship leads us to focus on the trade intensity indicator.

The analysis is augmented to control for whether the trade integration variables have a differential impact on business cycle synchronization in the Arab region by including a dummy variable and its interaction with the bilateral trade intensity and specialization variables. The dummy takes value 1 when both the reporting and partner countries are from the Arab region and 0 otherwise. In a parsimonious specification, where this dummy variable is interacted only with

the bilateral trade intensity variable, it is estimated that the positive effect of trade integration on business cycle synchronization is turns negative for Arab country pairs (Table 4). The negative coefficient of the interaction term between Arab-country pair dummy and the trade intensity indicator is fairly robust. In fact, the effect of the bilateral trade intensity indicator on growth quasi-correlation becomes negative for Arab country pairs. The impact of the remaining trade integration and specialization indicators on output co-movement do not appear to differ across Arab country pairs and country pairs with at least one non-Arab partner.

It is also interesting to see whether the nature of relationship trade integration and specialization among country pairs with an Arab and European partners differ systematically from other country pairs, motivated by the results presented above regarding Arab country pairs and relatively strong trade integration between some Arab and European countries. To this end, a dummy variable that takes on the value 1 when a country pair is composed of an Arab and a European country is created and interacted with the trade integration and specialization indices. It is estimated that trade intensity has a rather large effect on BCS for Arab-EU country pairs. Also, the differential impact of the trade intensity of Arab-EU country pairs with respect to other country pairs is positive and statistically and economically significant (Table 5). The interaction term, however, turns negative for the other indices and is highly statistically significant in the case of the trade specialization correlation and trade complementarity indices. In those cases, the coefficient of the interaction term is large enough to offset the positive coefficient of the trade variable, overall yielding a negative effect for the Arab-EU country pairs.

Table 5: Differential impact of trade integration on business cycle synchronization in the Arab region and the Arab-EU country pairs

Dependent variable: growth quasi-correlation	(1)	(2)	(3)	(4)	(5)
lagged trade intensity	0.069***	0.064***	0.069***	0.062***	0.057***
	[0.016]	[0.016]	[0.016]	[0.017]	[0.017]
lagged trade intensity*Arab-EU pair dummy	0.970***	0.980***	0.949***	0.959***	0.964***
	[0.182]	[0.182]	[0.182]	[0.188]	[0.188]
lagged intra industry trade index		0.201***	0.202***	0.240***	0.238***
		[0.035]	[0.035]	[0.039]	[0.039]
lagged intra industry trade index*Arab-EU pair dummy		-0.176	-0.186	-0.216	-0.216
		[0.183]	[0.183]	[0.195]	[0.195]
lagged trade specialization correlation index			0.362***	0.409***	0.425***
			[0.036]	[0.040]	[0.040]
lagged trade specialization correlation index*Arab-EU pair dummy			-0.722***	-0.706***	-0.723***
			[0.193]	[0.204]	[0.205]
lagged export concentration index				-0.005	-0.004
				[0.008]	[0.008]
lagged export concentration index*Arab-EU pair dummy				-0.017	-0.019
				[0.040]	[0.040]
lagged trade complementarity index					0.222***
					[0.027]
lagged trade complementarity index*Arab-EU pair dummy					-0.331**
					[0.165]
Constant	0.027***	0.025***	0.033***	0.038***	-0.040***
	[0.007]	[0.007]	[0.007]	[0.008]	[0.013]
country-pair fixed effects	yes	yes	yes	yes	yes
time-fixed effects	yes	yes	yes	yes	yes
Observations	374088	374088	374088	342655	342655
R-squared (within)	0.093	0.093	0.093	0.101	0.101
Number of pairs	27788	27788	27788	27080	27080

Standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

6. Conclusion

The impact of trade integration on business cycle synchronization has been the subject of a voluminous literature. This literature both empirically and theoretically assesses the channels through which trade linkages influence output co-movement between country pairs. The empirical analyses by and large point to a robust positive relationship between trade integration and business cycle convergence. Consistent with the literature, we add to the body of evidence that bilateral trade intensity is positively associated with business synchronization, over a large sample of countries, covering essentially the entire world, over the period 1995-2013. The bilateral trade

intensity indicator is most robustly associated with the business cycle synchronization measure, growth quasi-correlation, maintaining its sign and significance across different model specifications and when possible endogeneity issues are addressed. In fact, the impact of the trade intensity indicator becomes much larger in instrumental variable estimations.

The analysis also sheds some light on the nature of trade integration and output co-movement in the Arab region. Bilateral trade intensity appears to have a statistically robust, negative impact on business cycle synchronization among Arab country pairs. Moreover, other trade integration and specialization measures do not have a differential impact on Arab country pairs vis-à-vis the rest of the world (all other country pairs with at least one non-Arab partner). By contrast, among country pairs composed of an Arab and EU country, bilateral trade intensity variable has as stronger influence on business cycle synchronization compared with the rest of the country pairs. Also, the remaining trade integration and specialization indices have a lower and in some cases negative effect on output co-movement.

It is of importance to explore what drives these results. In particular, to what extent the fact that policy co-ordination and financial integration are missing in the analysis has a bearing on these results is one avenue to further scrutinize the robustness of the findings. In this regard, explaining what factors set Arab countries set them apart from the rest of the countries in terms of the underlying mechanisms through which trade integration and business remains a key issue.

Several studies analyzed the factors behind the persisting low level of intra-Arab trade despite the full implementation of PAFTA in 2005 (ESCWA, 2014 and 2015). Findings show that weak financial integration, low level of economic diversification, restrictive NTMs, and absence of commitments on liberalization of trade in services represent the main barriers to makes PAFTA deliver on its promises of increasing intra-regional trade and flows of investments.

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Appendix 1: Trade indicators

Trade intensity

Bilateral trade intensity is the most commonly used trade indicator to capture to importance of bilateral trade flows. If for instance, trade volumes are high between two countries, it is more likely to have economy-wide shocks transmitted from one country to another through demand and supply linkages. In particular, bilateral trade intensity is defined as:

$$T_{ij} = \frac{X_{ij} + M_{ij}}{GDP_i + GDP_j}$$

where X_{ij} (M_{ij}) stands for total exports (imports) of country i to (from) its partner j, and GDP_i and GDP_j represent the GDPs of country i and j, respectively.

This particular choice of trade intensity indicator uses the partner countries' GDPs to scale bilateral trade flows but total reporter country exports to and imports from all countries and the GDP of the reporter country alone are also considered as scaling factors in the literature. For instance, Clark and van Wincoop (2001) use the product of partner countries' GDPs as the scaling factor. Inklar et al. (2008) also experiment with the product of partner countries' total global trade volumes (the sum of global imports and exports) as the scaling factor. This approach, however, fails to capture the relative importance of trade flows in the economy as a whole. Otto et al. (2001) on the other hand argue that it may be even more important to capture whether at least one country is exposed to the other in a pair. To this end, they take the maximum of total bilateral trade volumes of a country pair scaled by their respective GDPs.

As there are a number of possible proxies for trade intensity and it is not clear which measure should be preferred, combining different trade intensity indicators into a single measure is another approach. For example, Inklar et al. (2008) combine six different trade intensity measures, derived using different scale factors into a single one based on principal component analysis.

These alternative measures of trade intensity are experimented with in the current study, although the results remain qualitatively the same.

Export concentration index

The export concentration index, also referred to as Herfindahl-Hirschmann index, is a measure of market concentration[8]. The export concentration index captures how exports of

[8] The import concentration index can be analogously defined and calculated.

individual countries or group of countries are distributed over products. More specifically, it measures whether exports are concentrated in several products or distributed in a more homogeneous manner over a range of goods. The export concentration index is expressed as:

$$HHI_{ij} = \frac{\sqrt{\sum_{g=1}^{n}(X_{ij}^{g}/X_{ij})^2} - \sqrt{1/n}}{1 - \sqrt{1/n}}$$

where the subscript g indexes the total of n goods that are subject to trade between the country pair, X_{ij}^{g} stands for the exports of country i, of good g, to its partner j and X_{ij} denotes total merchandise exports of country i to the partner country j.

The index is normalized to obtain values that range between 0 and 1. The maximum value of 1 is attained when all merchandise exports are concentrated in a single product.

Intra-industry trade index

The intra-industry trade index for a country pair i-j measure the share of intra-industry trade relative to inter-industry trade between the two countries. The intra-industry trade index, as suggested by Grubel and Lloyd (1975), could be calculated as:

$$IIT_{ij} = 1 - \frac{\sum_{g=1}^{n}|X_{ij}^{g} - M_{ij}^{g}|}{\sum_{g=1}^{n}(X_{ij}^{g} + M_{ij}^{g})}$$

where X_{ij}^{g} (M_{ij}^{g}) denotes the exports (imports), of good g, of country i to (from) its partner j.

Trade complementarity index

The merchandise trade complementarity index measures the extent to which the export profile of a country matches the import profile of a partner country. Following Michaely (1996), the merchandise trade complementarity index for a country pair i-j, TCI_{ij}, is calculated as:

$$TCI_{ij} = 1 - \frac{\sum_{g=1}^{n}|E_{i}^{g} - M_{j}^{g}|}{2}$$

where E_{i}^{g} stands for the share of good g in country i's total exports to the world and M_{j}^{g} represents the share of good g in country j's total imports from the world.

The index values range from 0 to 1, with 0 indicating that there is no correspondence between country i's export structure and country j's import structure and 1 indicating a perfect match in their export/import pattern. High values of the index suggests that two countries may gain from trade expansion following a preferential trade agreement, but this crucially depends on transportation and transaction costs. Also, a high complementarity index, indicating a high degree of match between the share of exports and imports of a country pair, do not necessarily mean potentially large gains from a trade agreement between the two. If size differences between the two economies are substantial, a match in shares of goods in exports and imports does not imply a match in levels.

Merchandise trade specialization correlation index

The bilateral trade specialization correlation index measures to what extent economies are net exporters of the same set of products and consequently competitors in global markets or natural trading partners. It essentially is a simple correlation coefficient between the trade specialization indices of a country pair i-j, and the resulting index can take a value between -1 and 1. It is given by:

$$TSC_{ij} = \frac{\sum_{g=1}^{n}(TSI_i^g - \overline{TSI_i})(TSI_j^g - \overline{TSI_j})}{\sqrt{\sum_{g=1}^{n}(TSI_i^g - \overline{TSI_i})^2 \sum_{g=1}^{n}(TSI_j^g - \overline{TSI_j})^2}}$$

The trade specialization index, TSI_i^g, for country i and good g is in turn defined as:

$$TSI_i^g = \frac{X_i^g - M_i^g}{X_i^g + M_i^g}$$

where X_i^g (M_i^g) stands for total exports (imports) of country i of good g. $\overline{TSI_i}$ denotes the average value of the trade specialization index for country i over n products/industries in a given year.

Appendix 2: detailed results

Table 6 Mean growth quasi-correlations between Arab countries over the period 1998-2013

	DZA	BHR	COM	DJI	EGY	IRQ	JOR	KWT	LBN	LBY	MRT	MAR	OMN	QAT	SAU	SDN	SYR	TUN	ARE	YEM
DZA		0.11	0.12	0.09	-0.30	-0.13	0.02	0.22	-0.04	0.06	0.11	0.07	-0.48	-0.27	0.16	0.16	0.01	0.01	0.05	0.05
BHR	0.11		-0.13	0.13	0.16	0.03	0.12	0.12	0.01	0.05	0.15	0.00	-0.07	0.14	0.19	0.19	0.03	0.18	0.13	0.16
COM	0.12	-0.13		-0.02	-0.23	-0.07	-0.02	-0.04	-0.04	-0.04	0.05	0.13	-0.02	-0.24	-0.15	-0.02	0.06	-0.07	-0.05	-0.04
DJI	0.09	0.13	-0.02		-0.05	-0.03	0.09	0.05	0.04	-0.12	0.23	0.05	-0.17	0.20	0.36	-0.09	0.03	-0.09	0.00	-0.33
EGY	-0.30	0.16	-0.23	-0.05		0.06	0.18	-0.15	0.09	0.01	-0.04	-0.05	0.28	0.39	-0.04	0.52	-0.09	0.40	0.01	0.40
IRQ	-0.13	0.03	-0.07	-0.03	0.06		0.06	-0.06	0.02	-0.01	0.08	0.03	0.06	0.28	0.06	-0.15	0.20	0.09	-0.01	-0.01
JOR	0.02	0.12	-0.02	0.09	0.18	0.06		0.05	0.04	-0.02	0.02	0.03	0.00	0.18	0.08	0.27	0.13	0.12	0.05	0.13
KWT	0.22	0.12	-0.04	0.05	-0.15	-0.06	0.05		-0.05	0.04	0.22	0.05	-0.18	0.00	0.25	0.02	0.04	0.02	0.24	-0.17
LBN	-0.04	0.01	-0.04	0.04	0.09	0.02	0.04	-0.05		-0.01	-0.13	0.01	0.07	0.10	0.03	0.07	0.08	0.03	-0.07	0.05
LBY	0.06	0.05	-0.04	-0.12	0.01	-0.01	-0.02	0.04	-0.01		0.20	-0.11	0.15	-0.15	-0.02	-0.29	-0.03	0.38	0.03	0.59
MRT	0.11	0.15	0.05	0.23	-0.04	0.08	0.02	0.22	-0.13	0.20		0.08	-0.17	0.13	0.26	-0.16	-0.15	0.13	0.29	-0.11
MAR	0.07	0.00	0.13	0.05	-0.05	0.03	0.03	0.05	0.01	-0.11	0.08		-0.01	0.12	0.06	0.08	0.15	-0.01	-0.01	-0.05
OMN	-0.48	-0.07	-0.02	-0.17	0.28	0.06	0.00	-0.18	0.07	0.15	-0.17	-0.01		0.19	-0.14	-0.11	0.16	0.06	-0.09	0.23
QAT	-0.27	0.14	-0.24	0.20	0.39	0.28	0.18	0.00	0.10	-0.15	0.13	0.12	0.19		0.25	0.25	0.27	0.10	0.08	-0.10
SAU	0.16	0.19	-0.15	0.36	-0.04	0.06	0.08	0.25	0.03	-0.02	0.26	0.06	-0.14	0.25		-0.06	0.12	-0.01	0.19	-0.30
SDN	0.16	0.19	-0.02	-0.09	0.52	-0.15	0.27	0.02	0.07	-0.29	-0.16	0.08	-0.11	0.25	-0.06		0.05	0.31	0.06	0.42
SYR	0.01	0.03	0.06	0.03	-0.09	0.20	0.13	0.04	0.08	-0.03	-0.15	0.15	0.16	0.27	0.12	0.05		-0.13	-0.04	0.02
TUN	0.01	0.18	-0.07	-0.09	0.40	0.09	0.12	0.02	0.03	0.38	0.13	-0.01	0.06	0.10	-0.01	0.31	-0.13		0.09	0.54
ARE	0.05	0.13	-0.05	0.00	0.01	-0.01	0.05	0.24	-0.07	0.03	0.29	-0.01	-0.09	0.08	0.19	0.06	-0.04	0.09		-0.03
YEM	0.05	0.16	-0.04	-0.33	0.40	-0.01	0.13	-0.17	0.05	0.59	-0.11	-0.05	0.23	-0.10	-0.30	0.42	0.02	0.54	-0.03	

Table 7 Mean growth quasi-correlations between select countries and blocs over the period 1998-2013

	arab	gcc	uma	arab less gcc&uma	eu	POL	EU less POL	asean	VNM	asean less VNM	mercosur	nafta	CHN	IND	JPN	TUR	USA
arab		0.64	0.40	0.21	0.41	0.29	0.43	0.11	0.18	0.11	0.30	0.32	0.21	0.41	0.14	0.23	0.29
gcc	0.64		-0.11	0.01	0.34	0.28	0.35	0.24	0.25	0.24	0.44	0.15	0.29	0.27	0.16	0.43	0.11
uma	0.40	-0.11		0.10	0.13	0.01	0.15	-0.19	-0.27	-0.19	-0.43	0.44	-0.22	0.37	-0.10	-0.64	0.45
arab less gcc&uma	0.21	0.01	0.10		0.26	0.15	0.27	-0.12	0.09	-0.12	0.11	0.28	0.07	0.26	0.11	0.10	0.27
eu	0.41	0.34	0.13	0.26		0.34	1.42	0.22	0.29	0.22	0.35	0.94	0.22	0.03	0.78	0.56	0.89
POL	0.29	0.28	0.01	0.15	0.34		0.35	0.01	0.12	0.01	0.32	0.19	0.25	0.34	0.07	0.23	0.17
EU less PO	0.43	0.35	0.15	0.27	1.42	0.35		0.23	0.30	0.23	0.36	1.00	0.23	0.03	0.82	0.59	0.94
asean	0.11	0.24	-0.19	-0.12	0.22	0.01	0.23		0.26	1.43	0.48	0.09	0.36	0.10	0.91	0.61	0.07
VNM	0.18	0.25	-0.27	0.09	0.29	0.12	0.30	0.26		0.26	0.29	0.14	0.25	0.14	0.28	0.38	0.13
asean less VNM	0.11	0.25	-0.18	-0.13	0.22	0.01	0.22	1.46	0.26		0.50	0.08	0.36	0.12	0.92	0.62	0.07
mercosur	0.30	0.44	-0.43	0.11	0.35	0.32	0.36	0.48	0.29	0.48		0.14	0.41	0.43	0.43	0.68	0.09
nafta	0.32	0.15	0.44	0.28	0.94	0.19	1.00	0.09	0.14	0.09	0.14		-0.03	0.03	0.63	0.51	0.93
CHN	0.21	0.29	-0.22	0.07	0.22	0.25	0.23	0.36	0.25	0.36	0.41	-0.03		0.40	0.25	0.32	-0.04
IND	0.41	0.27	0.37	0.26	0.03	0.34	0.03	0.10	0.14	0.10	0.43	0.03	0.40		-0.04	0.19	0.03
JPN	0.14	0.16	-0.10	0.11	0.78	0.07	0.82	0.91	0.28	0.91	0.43	0.63	0.25	-0.04		0.69	0.59
TUR	0.23	0.43	-0.64	0.10	0.56	0.23	0.59	0.61	0.38	0.61	0.68	0.51	0.32	0.19	0.69		0.46
USA	0.29	0.11	0.45	0.27	0.89	0.17	0.94	0.07	0.13	0.07	0.09	0.93	-0.04	0.03	0.59	0.46	

Table 8 Mean growth quasi-correlations between Arab countries over the period 1980-1997

	DZA	BHR	COM	DJI	EGY	IRQ	JOR	KWT	LBN	MRT	MAR	OMN	QAT	SAU	SOM	SDN	SYR	TUN	ARE	YEM
DZA		0.00	-0.02	0.18	0.04	-0.04	0.02	0.01	-0.08	0.01	0.08	0.04	-0.02	-0.01	-0.01	0.00	-0.09	0.00	0.00	-0.08
BHR	0.00		0.05	-0.02	-0.01	0.14	-0.02	0.03	0.05	-0.04	-0.03	-0.01	0.01	0.04	-0.15	-0.06	0.01	0.02	-0.09	0.04
COM	-0.02	0.05		-0.09	0.10	0.00	0.06	-0.07	0.00	-0.03	-0.32	0.05	0.53	-0.02	-0.02	-0.05	0.00	0.05	-0.05	-0.09
DJI	0.18	-0.02	-0.09		0.14	-0.37	0.23	-0.08	-0.11	0.12	0.25	0.29	0.76	0.36		-0.54	-0.01	0.19	-0.03	-0.40
EGY	0.04	-0.01	0.10	0.14		-0.01	0.00	-0.09	-0.04	-0.05	0.05	0.03	0.06	0.05	-0.08	-0.14	-0.02	0.04	0.02	-0.10
IRQ	-0.04	0.14	0.00	-0.37	-0.01		-0.01	-0.04	-0.04	0.03	-0.20	-0.05	0.16	0.05	-0.04	0.09	0.00	0.13	0.07	0.05
JOR	0.02	-0.02	0.06	0.23	0.00	-0.01		0.00	-0.03	0.04	0.15	0.05	-0.02	0.10	0.04	-0.04	-0.02	0.01	0.01	-0.11
KWT	0.01	0.03	-0.07	-0.08	-0.09	-0.04	0.00		0.01	0.14	-0.20	-0.01	-0.06	-0.12	-0.14	0.02	-0.20	-0.14	-0.01	0.02
LBN	-0.08	0.05	0.00	-0.11	-0.04	-0.04	-0.03	0.01		0.01	0.05	-0.02	-0.09	0.02	0.18	-0.01	0.03	-0.06	0.00	0.01
MRT	0.01	-0.04	-0.03	0.12	-0.05	0.03	0.04	0.14	0.01		-0.02	0.02	-0.75	0.01	-0.03	0.07	-0.04	-0.07	0.07	-0.16
MAR	0.08	-0.03	-0.32	0.25	0.05	-0.20	0.15	-0.20	0.05	-0.02		0.01	-0.95	0.17	0.11	-0.26	0.02	-0.20	-0.35	0.16
OMN	0.04	-0.01	0.05	0.29	0.03	-0.05	0.05	-0.01	-0.02	0.02	0.01		0.15	0.02	0.02	-0.05	0.00	0.02	-0.02	-0.12
QAT	-0.02	0.01	0.53	0.76	0.06	0.16	-0.02	-0.06	-0.09	-0.75	-0.95	0.15		0.14		-0.20	0.00	0.22	-0.03	-0.10
SAU	-0.01	0.04	-0.02	0.36	0.05	0.05	0.10	-0.12	0.02	0.01	0.17	0.02	0.14		-0.12	-0.08	0.08	0.01	0.15	-0.13
SOM	-0.01	-0.15	-0.02		-0.08	-0.04	0.04	-0.14	0.18	-0.03	0.11	0.02		-0.12		0.23	-0.10	0.07	-0.24	
SDN	0.00	-0.06	-0.05	-0.54	-0.14	0.09	-0.04	0.02	-0.01	0.07	-0.26	-0.05	-0.20	-0.08	0.23		-0.07	-0.16	-0.09	0.14
SYR	-0.09	0.01	0.00	-0.01	-0.02	0.00	-0.02	-0.20	0.03	-0.04	0.02	0.00	0.00	0.08	-0.10	-0.07		0.01	0.00	0.02
TUN	0.00	0.02	0.05	0.19	0.04	0.13	0.01	-0.14	-0.06	-0.07	-0.20	0.02	0.22	0.01	0.07	-0.16	0.01		0.06	-0.02
ARE	0.00	-0.09	-0.05	-0.03	0.02	0.07	0.01	-0.01	0.00	0.07	-0.35	-0.02	-0.03	0.15	-0.24	-0.09	0.00	0.06		0.00
YEM	-0.08	0.04	-0.09	-0.40	-0.10	0.05	-0.11	0.02	0.01	-0.16	0.16	-0.12	-0.10	-0.13		0.14	0.02	-0.02	0.00	

Table 9 Mean growth quasi-correlations between select countries and blocs over the period 1980-1997

	arab	gcc	uma	arab less gcc&uma	eu	POL	EU less POL	asean	VNM	asean less VNM	mercosur	nafta	CHN	IND	JPN	TUR	USA
arab		0.05	0.07	0.06	0.06	-0.09	0.05	0.01	-0.03	0.01	0.03	-0.07	-0.06	0.01	0.07	-0.02	-0.09
gcc	0.05		0.05	0.03	0.03	-0.08	0.02	-0.02	-0.02	-0.02	0.04	-0.03	-0.04	-0.02	0.04	-0.02	-0.04
uma	0.07	0.05		0.04	0.03	0.00	0.03	-0.05	0.05	-0.05	-0.01	0.02	-0.05	-0.04	0.00	-0.02	-0.06
arab less gcc&uma	0.06	0.03	0.04		0.03	-0.05	0.03	0.01	-0.06	0.01	-0.01	-0.02	-0.03	0.02	0.04	-0.04	-0.04
eu	0.06	0.03	0.03	0.03		-0.05	0.03	0.00	-0.10	0.00	-0.01	-0.01	-0.04	0.00	0.05	-0.04	-0.03
POL	-0.09	-0.08	0.00	-0.05	-0.05		-0.05	-0.02	0.94	-0.02	-0.13	0.24	0.09	0.20	-0.35	0.32	0.25
EU less PC	0.05	0.02	0.03	0.03	0.03	-0.05		0.00	-0.09	0.00	-0.01	-0.01	-0.04	0.00	0.04	-0.04	-0.02
asean	0.01	-0.02	-0.05	0.01	0.00	-0.02	0.00		0.38	0.24	0.00	0.00	0.03	0.05	0.00	0.01	-0.04
VNM	-0.03	-0.02	0.05	-0.06	-0.10	0.94	-0.09	0.38		0.38	0.02	0.11	0.09	0.13	-0.59	0.20	-0.02
asean less VNM	0.02	-0.02	-0.05	0.01	0.01	-0.02	0.01	0.24	0.41		-0.05	-0.01	0.03	0.07	-0.01	0.00	-0.07
mercosur	0.03	0.04	-0.01	-0.01	-0.01	-0.13	-0.01	0.00	0.02	0.00		-0.03	0.04	-0.16	-0.02	-0.05	-0.01
nafta	-0.07	-0.03	0.02	-0.02	-0.01	0.24	-0.01	0.00	0.11	0.00	-0.03		0.07	0.02	0.03	-0.01	0.22
CHN	-0.06	-0.04	-0.05	-0.03	-0.04	0.09	-0.04	0.03	0.09	0.03	0.04	0.07		-0.03	-0.03	0.05	0.09
IND	0.01	-0.02	-0.04	0.02	0.00	0.20	0.00	0.05	0.13	0.05	-0.16	0.02	-0.03		0.01	-0.08	0.02
JPN	0.07	0.04	0.00	0.04	0.05	-0.35	0.04	0.00	-0.59	0.00	-0.02	0.03	-0.03	0.01		-0.02	0.01
TUR	-0.02	-0.02	-0.02	-0.04	-0.04	0.32	-0.04	0.01	0.20	0.01	-0.05	-0.01	0.05	-0.08	-0.02		0.03
USA	-0.09	-0.04	-0.06	-0.04	-0.03	0.25	-0.02	-0.04	-0.02	-0.04	-0.01	0.22	0.09	0.02	0.01	0.03	