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The Analysis of Trade Integration and Business Cycles Synchronization with Emphasis on Regional Arrangements among OIC Nations

Farzad Karimi, PhD.

Assistant Professor of Economics

Islamic Azad University, Mobarekeh Branch, Iran

(Email address: farzadkarimi@mau.ac.ir)

Akbar Tavakoli, PhD.

Associate Professor of Economics

Isfahan University of Technology, Iran

(Email address: atavakoli@cc.iut.ac.ir)

Abstract:

New international trade theories emphasize on the synchronization of economic fluctuations arising from trade integration and multilateral trade flows among countries. However, this is still not cleared regarding to Islamic nations. The main purpose of the present paper is to analyze the trade flows among Organization of the Islamic Conference (OIC) member nations applying proper trade integration indexes (including inter-industry, intra–industry, and complementary trades) and a statistical method to measure business cycles synchronization (BCS). The data covers Islamic nations and three major regional blocks of ECO, GCC, and D8 for the globalization period of 1990 to 2005. The following results are found.

(1) The BCS index shows a high correlation coefficient of 0.70 for OIC nations and 0.497, 0.943, and 0.972 for GCC, ECO and D8, respectively. This confirms the positive effect of regional economic arrangements on the BCS.
(2) Among the OIC partners, about 85 percent and 15 percent of total trade are related to inter-industry trade and intra–industry trade, respectively. The average inter-industry trade index also shows a significant increase of trade intensity to a level of 4.4 among OIC nations. As a result of regional blocks, the trade integration indices dramatically improved among the member nations and particularly the flows of intra-industry trade intensities increased by three times (0.562 and 0.417 in GCC and D8 members, respectively) compared to Islamic nations as a whole.
(3) The level of complementary trade index is 3.6 for OIC members, compared to ECO, D8, and GCC with the values of 0.99, 1.02, and 1.50, respectively. The GCC regional block shows relatively more complementary trades than the other two blocks.
(4) Overall, the BCS index and trade integration indexes are relatively high for all Islamic nations and particularly for regional blocks during the globalization

period. It seems that the block arrangements among Islamic nations can strengthen the BCS as well as trade integration, and in particular intra–industry trade.

The policy implication of the finding is clear. Islamic nations should enhance their trade integration in order to synchronize business cycles more effectively. As the OIC nations joining regional block arrangements and following rules and regulations, they could strengthen the BCS.

Keywords: Trade Integration, Business Cycles Synchronization, OIC Nations, Regional Block Arrangements

JEL Classification: F14, F15, C30

1. Introduction

The main purpose of the present paper is to analyze the trade flows among Organization of the Islamic Conference (OIC) member nations applying proper trade indexes and a statistical method to measure business cycles synchronization (BCS) and trade integration (including inter-industry, intra–industry, and complementary trades) during the period of 1990-2005. Analyzing the BCS and trade integration patterns, the feedback of regional block arrangements is examined to show how the regional block arrangements may enhance the trade integration relation with BCS. The analysis further seeks to highlight the possibility of monetary union arrangement among Islamic nations. In deciding whether to join a currency union policymakers need to compare the benefits and costs of membership (Mundell, 1961; McKinnon, 1963). The main advantage of a single currency is the potential gains to trade and international investment that could arise from eliminating currency conversion costs and removing the uncertainty arising from unexpected exchange rate movements. The cost depends upon the degree of **BCS** between member nations. The gains from monetary autonomy are minimized if member countries are exposed to symmetric shocks or if they can absorb the effects of asymmetric shocks.

The increasing integration of the world economy, through the liberalization of trade and capital flows, has raised the possibility of a more rapid transmission of business cycle fluctuations across countries (Akin, 2006). As Krugman (1993. p.98) argues, ‘‘a pair of countries that trade more may specialize more in order to reap the gains from trade. This would lead to even greater differences between each country’s industrial structure, and in the presence of sector-specific shocks (even if these are common across countries) it can lead to more idiosyncratic business cycles.’’ Empirical studies confirm the relation between trade integration and business cycles (Frankel and Rose; 1998, Shin & Wang, 2005; Baxter &

Kouparitsas, 2005). It is further argued that the importance of this effect depends upon the degree of specialization induced by trade integration, which tends to rise with the ratio of inter-industry to intra-industry trade. The net effect on business cycles depends upon the relative importance of aggregate and sector specific shocks. If the relative variance of aggregate shocks is greater than that of sector-specific shocks, closer trade integration could be expected to lead to more synchronized business cycles (Frankel & Rose 1998, Andrews & Kohler, 2009).

From a theoretical point of view, increased trade across countries can cause business cycles to move in either direction—toward convergence or divergence. If trade is mainly à la Heckscher-Ohlin or is of the Ricardian type, greater specialization would induce the industrial structures of the trading countries to diverge, resulting in less synchronized movements. But, if the demand channel is the dominant force driving business cycles, we expect trade integration to increase cycle correlation. Positive output shocks in a country might increase its demand for foreign goods. The impact of this shock on the cycle of the country's trading partners should depend on the depth of the trade links with each of the partners.

Therefore, economic theory does not provide definitive guidance concerning the impact of increased trade on the degree of business cycle synchronization. International trade linkages generate both demand and supply-side spillovers across countries. On the demand side, a consumption boom in one country can generate increased demand for imports, boosting economies abroad. Through these types of spillover effects, stronger international trade linkages can result in more highly correlated business cycles across countries. However, trade flows could also induce increased specialization of production resulting in changes in the nature of business cycle correlations. If stronger trade linkages are associated with increased inter-industry specialization across countries, and industry-specific shocks are important in driving business cycles, then international business cycle co-movement might be expected to decrease. In other words, if trade is mainly of intra-industry type or vertical specialization in various stages of production through outsourcing, then greater trade integration is likely to lead to a higher synchronization as a result of symmetric industry-specific shocks (Kose, *et. al*, 2003a).

In sum, the total effect of trade intensity on cycle synchronization is theoretically ambiguous. Important differences in the trade patterns and different specializations in trading countries suggest that the impact of trade integration on their cycles' coincidence may differ substantially between developing and developed countries. More generally, the mechanisms by which international trade affects BCS should be understood only when intra- and inter-industry trade effects are accounted for

separately. In addition, output co-movements can be enhanced if countries trade intensively with the same group of countries. From this perspective free trade agreements can augment the impact of bilateral trade through demand spillovers from similar trading partners.
Following this introduction, the BCS and trade integration measurement criteria are discussed and defined in section 2. The analysis and results are presented in section 3. The concluding remarks are summarized in last section.

2. BCS and Trade Integration Measurement Criteria

In this study three criteria of inter-industry trade, intra-industry trade, and complementary trade are used to measure trade integration. To measure BCS and integration the following indexes are applied.

2.1) BCS index

The BCS index is a key criterion to measure the degree of business cycle synchronization. Following Frankel and Rose (1998), and Akin (2006), the correlation coefficient (*corr*) between the cyclical components of output for countries i and j at time t is the most common index to measure BCS:

$$(1) \qquad corr\,(y_i^c, y_j^c) = \frac{\mathrm{cov}(y_i^c, y_j^c)}{\sqrt{\mathrm{var}(y_i^c)\,\mathrm{var}(y_j^c)}}$$

The variable y^c represent the logarithm of de-trended and real value of GDP. The value of GDP is in dollar term and its data is collected from the World Bank Development Statistics. The positive value of $corr\,(y_i^c, y_j^c)$ indicates a synchronized business cycle between two counties *i* and *j* and its negative value is an indication of non-synchronized business cycle. Different methods are used to de-trend a time series data. The present study uses the Hodrick and Presscott (1997) method.

To measure the average synchronization index for each country the following index is used:

$$(2) \qquad AY_{ij} = \frac{\sum_{j=1}^{n} ave_{ij}}{n}$$

The variable $avey_{ij}$ measures the average correlation coefficient of country i with other countries (j) and n indicates the number of selected countries.

2.2) Inter-industry trade index

Most previous studies on BCS have used alternative indexes for trade integration (see Clark, 2001; Akin, 2006; Frankle, *et. al,* 1998). The most common index is the trade intensity defined as the ratio of bilateral trade in a given region relative to trade of all countries (in the region) with the world or the ratio of exports and imports to production. However, applying this method trade intensity for OIC nationshas some drawbacks. In this method the trade intensity index is affected by the size and the volume of economic activities. The differences in sizes of developing countries make it difficult to compare the intensity and depth of trade by the use of share index of trade or production. This may result the trade intensity of one country with countries of large market sizes to be more than trade intensity with those of small market sizes. The method also lacks a threshold boarder. In other words, a higher value of the index represents more trade intensity between countries.

The present paper takes into account differences between the economic sizes of OIC members and applies the trade intensity index initiated and modified by Drysdel and Garnaut (1993) and Yeats (1997):

$$TII_{ij} = \frac{\left(\frac{X_{ij}}{X_{iw}}\right)}{\left(\frac{M_{jw}}{M_{ww}}\right)} \qquad (3)$$

The numerator (X_{ij}/X_{iw}) is the export ratio of country *i* to *j* relative to *i's* total exports, and the denominator (M_{jw}/M_{ww}) is the ratio of country *j* import to total world imports. The greater the index (above unity) indicates the greater the trade between two countries relative to their contributive share in world trade. This index can be modified as:

$$\bar{TII}_{ij} = \sum_{t=1}^{n} \frac{X_{ijt}}{X_{iwt}\left(\frac{M_{jwt}}{M_{iwt}}\right)} \qquad (4)$$

In equation (4), X_{ijt} and $X_{iwt}\frac{M_{jwt}}{M_{iwt}}$ are the actual and expected values of exports from country i to country j at time t, respectively.

To measure its average, (4) is modified to (5):

$$\bar{TII}_{ij} = \frac{1}{T}\sum_{t=1}^{n}\frac{X_{ijt}}{X_{iwt}\left(\frac{M_{jwt}}{M_{iwt}}\right)} \quad (5)$$

2.3) Intra-industry trade index

Initiated by Balassa, (1966), Vernon (1966), and Grubel and Lioyd (1975), the following modified index isapplied to measure intra -industry trade:

$$IIT_{ij} = \left(1 - \frac{\sum_{k}\left|X_{ijkt} - M_{ijkt}\right|}{\sum_{k}\left(X_{ijkt} + M_{ijkt}\right)}\right) \quad (6)$$

The terms X_{ijtk} and M_{ijk} are the values of exports of item k from country i to j and imports of item k by country j from country i at time t, respectively. The present study uses the average value as intra- industry trade index over the period (T):

$$\bar{IIT}_{ij} = 1/T\sum_{t=1}^{n}\left(1 - \frac{\sum_{k}\left|X_{ijkt} - M_{ijkt}\right|}{\sum_{k}\left(X_{ijkt} + M_{ijkt}\right)}\right) \quad (7)$$

2.4) Complementary trade index

To measure the complementary trade between two countries i and j, the indexes initiated by Balassa (1966) and Drysdel (1988) are modified as follows[1]:

[1] The derivation of formula is available from the authors

$$(8) \qquad CC_{ij} = \sum_{k \in s} \left[RCA_i^k \times \theta^k \times RMA_j^k \right]$$

to measure The parameter $\theta^k (= X_{ww}^k / X_{ww}^t)$ is the world export ratio in commodity k. the term RCA and RMA represent it's country comparative advantage and disadvantage in commodity k, respectively. This index is the new approach for analysis the countries export and import pattern. We use the equation (9) to measure the average value of CC_{ij} over the period (T):

$$(9) \qquad \overline{C}C_{ij} = \frac{1}{T} \sum_{k \in s} \left[RCA_i^k \times \theta^k \times RMA_j^k \right]$$

3. Analysis and Results

The OIC economy is a vast area and a large market. Its 57 Islamic nations covers 24 percent of world area. With one-third (or 21 percent) of world population, it is a huge market economy. About 18.2 percent of world employment is working in its area. During 1994- 2005, OIC's world trade grew fast and by an annual rate of 11.1 percent and its value jumped more than three times, from $600 billion (7 percent of world) in 1994 to $1900 billion (9percent of world) in 2005. During the same period, trades among its nations grew even faster and by annual rate of 14 percent.

This study covers a sample of 56 Islamic nations - all members of OIC- over the period 1990- 2005. The sample is also divided to three regional blocks of ECO, GCC, and D8. The analysis is based on BCS and trade integration (inter-industry trade, intra- industry trade, and complementary trade) criteria. To identify industrial sector commodities, the data with 6-digit HS codes are first aggregated to one digit numbers and relevant data are selected in accordance with the World Bank industrial sector classification.

Table.1 shows the results of BCS indexes for OIC members and the regional blocks members of ECO, GCC, and D8. The level of BCS index is 0.701 for OIC members and 0.497, 0.943, and 0.972 for ECO, GCC, and D8 regional blocks, respectively. The high values of BCS indexes for the regional blocks of GCC and D8 are impressive. Their high BCS values imply the strengthening and improving economic relationships among the regional block members. This suggests that regional block arrangements play significant roles in synchronizing business

cycles. When the sample includes only the positive values of BCS indexes, the level of BCS index for OIC members improves from 0.701 to 0.803 and its value rises significantly among ECO members from 0.497 to 0.655. For GCC and D8 members, the values of BCS indexes remain unchanged as a result of observing no negative BCS figures in these regions.

The inter-industry trade (measured by trade intensity), intra-industry trade, and complementary trade indexes are calculated and collected in Table.2 and 3. Comparing to BCS index values, a similar pattern is observed. For OIC members, the value of trade intensity index is 4.4 (far above unity). The result indicates a pro-trade integration. Among three regions, the level of trade intensity index among ECO members is the highest and equal to 16.8. When the trade integration index of low value (lower than 1) is excluded, the levels improve dramatically for OIC and all three regions.

Table.1: The OIC, ECO, GCC, and D8 BCS Indexes (1990-2005)

BCS Index			Positive BCS Index		
Region	**Covered Sample**	**Index**	**Covered Sample**	**Covered Sample (%)**	**Index**
OIC	2448	0.701	2243	92	0.803
ECO	72	0.497	60	83	0.655
GCC	20	0.943	20	100	0.943
D8	56	0.972	56	100	0.972

Note: Total sample is 3080 (= 55 times 56) for the OIC. The data was limited

for missing information in some cases

Table.2: The OIC, ECO, GCC, and D8 Inter-industry (Trade Intensity) Indexes (1990-2005)

Trade Intensity			$1 \leq$ Trade Intensity		
Region	**Covered Sample**	**Index**	**Covered Sample**	**Covered Sample (%)**	**Index**
OIC	3073	4.4	2008	65	6.6
ECO	89	16.8	70	79	21.2
GCC	30	3.9	20	67	5.7
D8	56	4.4	48	86	5.1

Note: See note in Table.1.

Table.3: Trade Intra–industry and Complementary Indexes

(1990-2005)

Region	Intra-industry trade index	Complementary trade index
OIC	0.150	3.60
ECO	0.241	0.99
GCC	0.417	1.50
D8	0.562	1.02

The results show that about 65 percent of the OIC members and 67 to 86 percent of regional blocks they have the trade intensities of higher than unity. Among three regions, the ECO has the highest trade intensity of 21.2. Once again, this confirms the effect of regional block arrangements on trade integration in Islamic nations. Since strengthening inter-industry trade is pro business cycles co-movement, the demand channel is a dominant force driving business cycles among OIC members and in particular among regional blocks.

The values of intra-industry and complementary trade indexes are collected in Table.3. The value of intra-industry trade index is 0.15 for OIC members compared to 0.241, 0.417, and 0.562 for ECO, GCC, and D8 members, respectively. Therefore, even though the value of intra-industry trade is small among Islamic nations, but the regional block arrangements of ECO, GCC, and D8 have strengthened its level effectively. As a matter of fact the OIC nations are mainly dependent on their abundant natural resources to export; therefore, they have specialized less to produce and export industrial goods.

In industrial sector, the level of intra-industry trade is an important factor representing the degree of specialization, varieties, and technical progress. Its improvement expands the market competition globally to access new trade opportunities. An increasing amount of trade is vertical or fragmented, that is, countries are increasingly specializing in particular stages of a good's production sequence, instead of producing the entire good (Caldran *et. al,* 2002). Allowing

for more of this "back-and-forth" trade might lead to a greater response of the business cycle correlations to higher trade integration (Kose & Yi, 2001). Stone and Lee (1995) argue that as the economy industrialized its trade relation will be more intra-industry trade. Frankel and Rose (1998), Shin and Wang (2003), Kose, Prasad, and Terrones (2003b) show that intra-industry trade is a major factor in synchronizing business cycles.

From Table.3, the level of complementary trade index is 3.6 for OIC members. The high value (higher than one) of the index indicates the similarity of patterns between the pair nations of exporters and importers. The values of indexes for ECO, D8, and GCC are 0.99, 1.02, and 1.50, respectively. Therefore, the GCC regional block shows relatively more complementary trades than the other two blocks.

4. Concluding Remarks

Applying BCS and trade integration indexes to OIC members and its major regional blocks ECO, GCC, and D8 for the period of 1990-2005, the following results are observed:

1. A calculated BCS level of 0.701 for OIC members implies the synchronization of business cycles among Islamic nations. Compared to regional blocks, the BCS value indexes of 0.497, 0.943, and 0.972 are observed for ECO, GCC, and D8, respectively. The implication is that the strengthening and improving economic relationships among nations through regional blocks play significant roles in synchronizing business cycles.
2. Including only the BCS indexes with positive values, the levels improve from 0.701 to 0.803 for OIC members and from 0.497 to 0.655 for ECO members. The BCS positions of GCC and D8 remain unchanged as a result of no negative BCS index figures. The high BCS values imply Islamic nations' readiness to unify their currencies and set a monetary union.
3. The inter-industry index (measured by trade intensity) of 4.4 is obtained for OIC members, comparing to 16.8, 4.4, and 3.9 values for ECO, D8, and GCC regions, respectively. When the trade intensity indexes with the values of lower than one are excluded, the values improve significantly to the levels of 6.6 (OIC), 21.2 (ECO), 5.7 (GCC), and 5.1 (D8). The high values of trade intensities are the indicaton s of pro-trade integration among Islamic nations.
4. Overall, 65 percent of OIC members and 67 to 86 percent of regional blocks declare high trade intensities of far above unity. Among three blocks, the ECO region has the highest trade intensity. These figures also confirm how

regional block arrangements may play significant roles to integrate trade and synchronize business cycles.

5. Since strengthening inter-industry trades are pro business cycles co-movements, it may imply that demand channels are dominant forces driving business cycles among OIC members and regional blocks in particular.
6. For OIC members as a whole, the value of intra-industry index is at its low value of 0.15 compared to its inter-industry trade value of 0.85. However, for regional blocks of ECO, GCC, and D8, the values are much (up to three times) higher and at 0.241, 0.417, and 0.562, respectively. This implies the intra-industry trade s ofabout 50 percent among GCC and D8 members. The result further affirms the power of regional block arrangements in strengthening the intra-industry status in Islamic nations.
7. Comparing complementary trade indexes, the GCC regional block shows relatively more complementary trades than the other two block.

The policy implication of the finding is clear. Islamic nations should enhance their trade integration in order to synchronize business cycles more effectively. As the OIC nations joining regional block arrangements and following rules and regulations, they could strengthen the BCS.

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