Relationship between Economic Integration and Business Cycle Synchronization

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Abstract

One of the basic tenets in recent international trade literature is about the effect of trade integration on business cycle synchronization (BCS) among trading countries. The objective of this paper is to explore the main determinants of business cycle synchronization, with emphasis on trade integration. To this end, we have specified two simultaneous regression equations which were estimated by weighted least squares method. The sample used data for the Organization of Islamic Countries for two consecutive periods; 1980-89 and 1990-2005.

The empirical result showed that trade integration is significantly the major factor of business cycle synchronization in Islamic countries, particularly during 1990-2005 period. In addition, it was shown that similarities in both fiscal and monetary policies as well as economics structures have had considerable influence on their BCS.

Key words: Trade Integration, Business Cycle Synchronization, OIC.

1. INTRODUCTION

Traditional literature on optimal currency areas (OCA) which began during the early 1960s with the work of Mundell (1961) and McKinnon 1963, aims to establish the conditions under which the benefits of joining a currency union would outweigh its costs. Among the key criteria considered in the OCA literature is the degree of trade integration between the potential members, as well as the degree of symmetry of their business cycles. The degree of integration matters because the reduction in transaction costs associated with the use of a common currency will have a larger impact, the larger the size of the trade and investment flows among the member countries. The symmetry of the business cycle, in turn, plays a key role in

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determining the cost of sacrificing an independent monetary policy (caldron, 2002).

In recent literature on international trade, the focus has been on the discussion of how trade integration affects BCS (Akin, 2006; Drozd, *et.al,* 2007). According to the theoretical literature, the impact of trade integration on business cycle correlation could go either way. On the one hand, if the demand channel is the dominant force driving business cycles, we expect trade integration to increase cycle correlation. For instance, 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. On the other hand, if industry-specific shocks are the dominant force in explaining cyclical output, the relationship would be negative if increasing specialization in production leads to inter industry trade (as observed in developing countries). In this case, trade integration leads to specialization in different industries, which in turn leads to asymmetric effects of industry-specific shocks. In contrast, if intra-industry trade prevails(as observed in industrial countries), specialization does not necessarily lead to asymmetric effects of industry-specific shocks, since the pattern of specialization occurs mainly within industries.

In summary, the total effect of trade intensity on cycle correlation is theoretically ambiguous and poses a question that could only be solved empirically. However, the important differences in the pattern of trade and specialization among countries of different type suggest that the impact of trade integration on cycle correlation in developing countries may differ substantially from that among industrial countries.

The objective of this paper is to explore the main determinants of BCS with emphasis on trade integration in the Islamic world. To this end, two simultaneous regression equations have been specified. For estimation, data pertinent to the OIC members for two consecutive time periods; 1980-89 (period related to international debt crisis) and 1990-2005(period mainly related to globalization) are used. The specified regressions have been estimated by weighted least squares (WLS) method.

After introduction, a section is devoted to the relevant theoretical literature which is followed by stipulated models. The following section presents the results of model estimation and the final section provides conclusion and some policy implications.

2 . THEORETICAL FRAMEWORK

Due to the speed of globalization, external factors have importance influence on business fluctuations of national economies. It is expected that with enhanced international trade, the economic interdependencies become stronger leading to more BCS. However, increased trade may not always lead to BCS between countries. For example, if trade encompasses a vast array of industrial products increased specialization causes the industrial structure of different countries to diverge, implying reduction in convergence of business fluctuations of trading countries.

Theoretically, trade integration may lead trading countries' business cycles in either direction: economic convergence (synchronization) or economic divergence (non- synchronization). BCS depends on bilateral trading relations and other structural and policy variables.

If demand shocks dominate business cycle fluctuations, one should expect trade integration to strengthen the transmission of shocks from one country to another, especially through the impact of these shocks on import demand. The presence of industry-specific shocks, however, may reinforce or offset this effect. In the case of the former, the effect of trade integration on BSC will be significantly positive. In the case of inter-industry trade based on comparative advantage, which leads each country to specialize in different industries, then the net effect of trade integration on the BCS may turn out to be negative (Eichengreen, 1992 and Krugman, 1993). In contrast, if trade is mostly of an intra-industry nature, so that the countries' production structures tend to become similar with enhanced trade, then trade integration should lead to a higher degree of the BCS (Frankel and Rose, 1998). In this context, the positive effect of trade on the BCS across industrial countries that has been found by several authors (e.g., Artis *et. al*, 1999; Clark *et. al*, 2001) could be due mainly to the intra-industry nature of their trade (Imbs, 1998, Fidrmuc, 2001).

In economic theory, various transmission channels are discussed through which fluctuations in the level of economic activity in one country may spill-over into other economies. However, these channels can influence cross-country output levels in either way. Thus, when the complexity and varying degree of intensity of economic activity across different countries are taken into account, the theory fails to provide any explicit direction as how enhanced cross-country output linkages lead to divergence or convergence of business fluctuations.

In sum, it can be argued that there is a consensus that strong trade relations and similarities in economic structures as well as monetary and fiscal policies, reinforces the process of BCS between two countries. However, the least related empirical study is about developing countries, particularly the OIC. In addition, the existing literature up to present has somehow ignored the importance of the measurement of transmission channels. The following sections present briefly the discussion over the main channels affecting BCS.

Trade in Goods and Services

Trade is an important vehicle to provide economic linkages between countries. Theoretically, however, there is no consensus on whether increased trade intensity leads to more or less synchronization of trading countries' business cycles. In fact, the effects of trade on partners' output and investment co-movements depend on the intrinsic characteristics of trade partners and on the nature of their relationships.

For example, it is being argued that if trade takes place mainly of Heckscher-Ohlin type, as usually observed in developing countries, specialization would induce the industrial structures of the trading countries to diverge resulting in less synchronized business cycles (Eichengreen, 1992). In contrast, it has been proposed that 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*, 2003).

Moreover, it is been argued that trade facilitates the transmission of aggregate shocks across countries when positive shock in one country increases demand for goods produced in other countries (Frankel and Rose, 1998). However, the magnitude of such spillover depends on the intensity of trade among countries. In addition to demand spillovers, the process of trade integration could foster diffusion of productivity, knowledge and technological shocks (Coe *et. al*, 1995).

The total effect of trade intensity on cycle synchronization is theoretically ambiguous and presents a question that could only be solved empirically. 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.

Similarities in Economic Structure

Another important determinant of co-fluctuations in business activities among countries is the similarity of production patterns in economic sectors even after holding financial and trade integration constant. An upward long-run trend in the process of BCS has been empirically documented, as economies grow, become increasingly diversified, and converge to similar production structure in their growth process. In contrast, poor countries which are typically characterized by limited diversification are typically associated with little co-fluctuations because they share few sectors with the rest of the world (Imbs, 2004). Furthermore, dependence on production of primary commodities (characteristic of poor countries) causes vulnerability to worldwide price fluctuations, affecting the idiosyncratic volatility.

Thus, based on theoretical argument and empirical observation, similarity in economic structure at the sectoral level can be considered as an important determinant of the BCS.

Similarity in Monetary and Fiscal Policies

The countries with strong trade relations are more likely to unify their currencies either in an explicit or an implicate manner. This fact denotes that countries with intensive trade and similar monetary (and perhaps other) policies have made symmetry in their trade cycles. One important implication, therefore, is that it is not only trade that may lead to BCS, but the similarities in economic policies are also important (Inklaar, 2005).

Some researchers have shown that the governments which use excessive expansionary fiscal policies create considerable and expansible instability in production and macroeconomic climate. The studies show that there exists a vast fundamental difference between developed and developing counties regarding the framework of fiscal policy behavior (Fatas, *et.al*, 2002].

On the other hand, the related literature refers to the potential benefits of applying fixed currency rates in Optimum Currency Area's (OCA). Although the literature on OCA points to the potential benefits of stable exchange rates, including reduction in transaction costs in trade and financial flows and a high degree of consistency in monetary policies for

member countries but yet, their macroeconomic behavior in general and their BCS in particular has not been well documented on both theoretical and empirical grounds.

3. MODEL SPECIFICATION

Based on the conceptual discussion presented above, the general form of the business cycle synchronization model is presented by the two following equations:

$$BSC_{ij} = \alpha_0 + \alpha_1 FSS_{ij} + \alpha_2 MSS_{ij} + \alpha_3 ESI_{ij} + \alpha_4 IIT_{ij} + \alpha_5 TII_{ij} + \varepsilon_t \qquad (1)$$

where BSC_{ij} represents the de-trended BCS between countries ***i*** and ***j***, FSS_{ij} is an index of similarity in fiscal policies of *i* and *j*, MSS_{ij} is an index of similarity in monetary policies of *i* and *j*, ESI_{ij} indicates the similarity in economic structure of the two countries, IIT_{ij} is an index of intra-industry trade between the two countries and TII_{ij} represents the trade integration index between them.

It should be mentioned however that the trade intensity between two partner countries might be endogenous in nature in this modeling, due to the following reasons:

- First, more intense synchronization between two countries' business cycles may encourage them to establish a monetary union which in turn results in an increase in trade intensity.

- Second, with a membership in a monetary union and reduction in transportation costs, countries make their monetary policies more in accord with those of their trading partners. The lower transportation costs enhance trade relations and provide a basis for more uniformity in mega-policies, which in turn may lead to more production co-movement. Therefore a membership in a monetary union can create a positive link between trade integration and synchronization in trade cycles.

Thus, the prejudged estimation of the above model can cause inconsistency in trade intensity variable coefficient. To resolve this problem and provide a consistent estimator of *ITT* coefficient (α_5), trade integration variable has been considered endogenous and a gravity model of bilateral trade with the use of instrumental variables is introduced (Deardorff, 1998; Anderson *et.al*, 2001):

$$TII_{ij} = \beta_0 + \beta_1 Z_{i1} + \beta_2 Z_{j2} + \beta_3 Z_{i3} + \beta_4 Z_{j4} + \beta_5 Z_{i5} + \beta_6 Z_{j6} + \beta_7 Z_{i7} + \beta_8 Z_{j8} + \beta_9 Z_{ij9} + \xi_{ij} \quad (2)$$

where TII_{ij} indicates bilateral trade intensity between the two countries *i* and *j*, Z_{i1} and Z_{j2} represent economies of scale (measured by GDP) of countries *i* and *j*, Z_{i3} and Z_{j4} are size of the markets (measured by the population size), Z_{i5} and Z_{j6} show the geographical size and Z_{j7}, Z_{j8} and Z_{j9} show the language, shared boarders and the distance between countries respectively.

The sample period selected is 1980-2005. In order to take account of the influence of time variable on the intensity of synchronous occurrence, as well as differences in regional economic affiliation and the income groups, the total period has been divided into two separate sub-periods (1980-1989 and 1990-2005).

4 VARIABLE MEASURMENT

Business Cycle Synchronization

One of the major variables in the above model is the paste of BCS between two countries *i* and *j* at time period *t*. To measure this variable, the time series correlation coefficient between de-trended GDPs of country *i* and *j* is used as follows (Akin, 2006; Shin and 2004; Calderon, *et.al*, 2002):

$$corr\,(y_i^c, y_j^c) = \frac{\text{cov}(y_i^c, y_j^c)}{\sqrt{\text{var}(y_i^c)\,\text{var}(y_j^c)}} \quad (3)$$

The term y^c represents de-trended GDP; y is logarithm of GDP on dollar basis, extracted from the World Bank's Development Index. The positive coefficient indicates the business cycle synchronization between two counties *i* and *j* while its negative sign is an indication of non-synchronization. Different approaches have been used in empirical research for de-trending time series data, since there is no consensus among researchers on the use of an appropriate technique. In this study Band-Pass (BP) and Hodrick and Presscott (HP) are being used.

Trade Integration Index

Most of the previous studies and research on BCS particularly during 1997-2007, have used alternative indices for trade integration index, like

different indices of trade intensity among trading countries. Studies by Clark (2001), Akin (2006) and Frankle, *et.al* (1998) are among them. In many of these studies the researchers have used the ratio of bilateral trade in a given region relative to trade of all countries (in the region) with the world. They have also used the ratio of exports and imports and even production. The application of the above methods for the OIC has its drawbacks, since the aforementioned trade intensity index between two countries is affected by the size and the volume of their economic activities. Hence, with respect to differences in the size of countries considered, it is not simple to compare the intensity and depth of their trade by the use of share index of trade or production, particularly for developing countries. This approach will show that trade intensity of one country with countries with larger market size, is more than trade intensity with those having smaller market size.

On the other hand, such indexes lack a threshold boarder. In other words, higher values of the index represent more trade intensity between countries. In this paper, in order to take account of the difference between the economic size of OIC member countries, the trade intensity index initiated by Drysdel (1998), and then modified by Drysdel, *et al*, (1993) and improved by Yeats (1997) is used as follows:

$$TII_{ij} = \frac{\left(\frac{X_{ij}}{X_{iw}}\right)}{\left(\frac{M_{jw}}{M_{ww}}\right)} \qquad (4)$$

The term (X_{ij}/X_{iw}) indicates the export ratio of country *i* to *j* relative to *i's* total exports, (M_{jw}/X_{ww}) is the ratio of country *j* import to total world imports. The greater this index above unity, the greater the trade between the two countries relative to their contributively share in world trade.

Intra-Industry Trade index

The intra-industry trade index, initiated by Grubel & Lloyd (1975) and used in this study is a weighted index of the average intra- industry trade:

$$IIT_{ij} = 1/T \sum_{t=1}^{n} \left(1 - \frac{\sum_{k} \left|X_{ijkt} - M_{ijkt}\right|}{\sum_{k} \left(X_{ijkt} + M_{ijkt}\right)}\right) \qquad (5)$$

where, X_{ijtk} is the nominal export of item k from country i to j at time t, M_{ijk} is the nominal value of imports of item k by country j from country i at time t.

For the lack of access to a complete data bank about world trade, this index has been calculated only for the 1990-2005 period. In addition, 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 accord with the World Bank industrial sector classification.

Similarity Index of Fiscal Policy

Fiscal shocks have strong, persistent and positive impact on output. Several papers in the literature have measured similarities in fiscal policy, using correlation coefficient or mean absolute difference of budget deficit to GDP ratios of country i and j for period t[1]. One major problem with this variable is that budget deficit (surplus) as proportion of GDP is strongly determined by the cyclical stance of the economy. For example, tax revenue increases in periods of economic booms, thus the government budget (surplus) becomes endogenous to the business cycle.

Given this limitation, this paper measures similarity index of fiscal policies, based on Akins (2006), by looking at the period average of the absolute differences in the government spending to GDP ratios of country i and j:

$$SGOV_{ij} = \frac{1}{T}\sum \left| \frac{gov_{it}}{gdp_{it}} - \frac{gov_{jt}}{gdp_{jt}} \right| \qquad (6)$$

where gov is the value of government expenses; gdp is gross domestic product and T shows the time period. $SGOV$ is the average index of similarity of fiscal policies.

Similarity Index of Monetary Policy

In order to measure the rate of harmonization in monetary policies, a correlation coefficient of mutual money supply of two countries are calculated based on the study of (Shin, *et. al*, 2004). For this, the growth rate

1. Van Wincoop and Clark (2001); Thellesen (2003); Shin and Wang (2004); Bergman (2004) and Darvas *et. al*, (2005)

of money in each country in the given time period is calculated first and the correlation coefficient between money growths is then estimated:

$$\rho_{ij} = \sum \frac{COV\ (i, j)}{\sigma_i \sigma_j} \qquad (7)$$

Here, the nominator is the amount of co-variance between the money growth rates of countries involved and the denominator is the product of standard deviation of the growth rates of countries *i* and *j*.

Similarity Index of Economic Structure

One of the most widely used indexes in the BCS related literature for measuring the similarities in production patterns in different sectors among pair of countries, is the concentration index, first introduced by Krogman (1993).

The similarity in the production structure is shown by the GDP portion provided by industry *k* in countries *i* and *j* (*k*= 1, 2… n) and represented by S_{ki} and S_{kj} which are measured by the following equation:

$$\sum_{k=1}^{N} \left| S_{ki} - S_{kj} \right| \qquad (8)$$

The high value of this index refers to a large divergence between economic structures of countries *i* and *j*. In this paper, equation (8) is used to produce the index for three economic sectors, namely, agriculture, industries and services for each year. Through the following equation, the mean index is calculated for assessing the similarity in economic structure between pair of Islamic countries:

$$S_{ij} = \frac{1}{T} \sum_{t} \left(\sum_{k} \left| S_{kit} - S_{kjt} \right| \right) \qquad (9)$$

In the following, first the results of the above indices are described and then, the estimated model of BCS is presented and analysed.

5 . THE RESULTS

As mentioned above, in order to evaluate factors determining BCS in Islamic countries, a simultaneous two equation model, including a BCS equation and a trade integration equation, is estimated for two consecutive time periods of 1980-89 and 1990-05 using weight least square method. The results are presented in Table (1). As can be seen, the coefficients of trade integration variable in both equations carry their expected signs and are statistically significant at %1 level.

Thus, it can be concluded that trade integration has had a positive and significant effect on business cycle synchronization in Islamic countries. By looking at the size of trade integration coefficients for two separate but consecutive time periods (O.13 with 0.009), it can clearly be seen that trade integration has had much stronger impact on OIC-BCS during (1990-2005) period, when the move toward worldwide economic integration and globalization took a new momentum. The enlargement of the size of this coefficient in this period has been so significant that made trade integration the most influential factor on the BCS.

On the other hand, the coefficients of similarity in fiscal policies and economic structure in both equations have the anticipated negative sign and are significant at %1 percent level. Although the degree of similarity in monetary policies and economic structure have an inverse relation with the size of their relevant indices, the negative coefficients of these indexes in the model indicate that the more the similarity in fiscal policies (smaller index figure), the more BCS is expected.

First equation	$BSC_{ij} = \alpha_0 + \alpha_1 FSS_{ij} + \alpha_2 MSS_{ij} + \alpha_3 ESI_{ij} + \alpha_4 IIT_{ij} + \alpha_5 TII$		Independent Variables
	Coefficient(t statistics) Period time: 1990-2005	Coefficient(t-statistics) Period time: 1980-89	
	0.87 (17.7)	1.17 (11.14)	Constant
	-0.05 (-3.7)	0.049 (- 2.0) -	$FSS_{i,j}$
	0.11 (3.6)	0.090 (2.17)	$MSS_{i,j}$
	-0.06 (-5.1)	0. 19 (- 6.7)-	$ESI_{i,j}$
	0.13 (38.1)	0.009 (2.76)	$TII_{i,j}$
	0.001 (0.36)	----------	$IIT_{i,j}$
	2542	1806	Observations
	0.46	0.06	(R-squared)
Second equation	$TII_{i,j} = \beta_0 + \beta_1 Z_{i1} + \beta_2 Z_{j2} + \beta_3 Z_{i3} + \beta_4 Z_{i4} + \beta_5 Z_{i5} + \beta_6 Z_{j6} + \beta_7 Z_7 + \beta_8 Z_8 + \beta_9 Z_9 + \xi$		Independent Variables
	Coefficient(t statistics) Period time: 1990-2005	Coefficient(t-statistics) Period time: 1980-89	
	-15.5 (-10.2)	22.7 (-9.1)	Constant
	0.40 (-3.7)	0.47 (6.3)	$(\tilde{z}_{j1})$
	0.37 (9.2)	1.01 (16.9)	$(\tilde{z}_{j2})$
	-0.23 (-4.01)	0.61 (5.9)	$(\tilde{z}_{j3})$
	-0.22 (-3.9)	---------	$(\tilde{z}_{j4})$
	0.05 (1.5)	0.1 (-1.33)-	$(\tilde{z}_{j5})$
	0.06 (1.67)	0.08 (1.4)	$(\tilde{z}_{j6})$
	0.80 (3.0)	2.5 (5.1)	$(\tilde{z}_{7})$
	0.58 (4.0)	1.65 (6.3)	$(\tilde{z}_{8})$
	-0.31 (-4.07)	2.22 (-15.0)-	$(\tilde{z}_{9})$
	2543	1806	Observations
	0.12	0.42	(R-squared)

Table 1: Regression Results (WLS method- 1980-89 & 1990-2005)

These results could be generalized and be applied to the similarity in economic structure. The coefficient of similarity in monetary policies is also positive at 99 percent significant level, indicating its important effect on the BCS. In contrast, the coefficients of intra-industry trade, though carry their

expected sign, but are not statistically significant. Accordingly, the intra-industry trade between Islamic countries cannot be counted as an influential factor regarding the BCS. This result is signified and supported by the fact that a large portion of trade in IOC is of inter-industry nature, regardless of the type of relation with dependent variable. Thus, intra-industry trade cannot be considered as an influencing factor on the rate of BCS in the IOC.

Regarding trade integration equation, the coefficient of the market size variable (GNP of the trading partners) is positive and stands at 1 percent level of significance. Thus, the market size which indicates the production potential of differentiated products and capability of exploiting economies of scale has had a positive and significant effect on trade intensity of countries concerned.

Since the model is in logarithmic form, the GDP coefficients show the elasticity of trade integration with respect to changes in the market size and production capability of the countries under study. The coefficient of this variable has been reduced from the first period to the next, which probably has been due to the reduction in the important role of differences in countries' economic structures, implying different market size which in turn has impact on shaping trade integration between countries.

The coefficients of variables related to common boarder (Z_7) distance (Z_9) and common language (Z_8) in equation (2) have their expected signs at 1 percent level of significance. While common border and language have had positive and statistically significant effect on mutual trade intensity, the distance has had negative effect, though this negative effect has been reduced from the first period to the next. Thus it seems that countries with common boarder and language and shorter distance from one another, are more effective to pursue trade integration, through reduction or elimination of trade barriers and more economic cooperation. These findings are not at odds with our expectations, since at the moment, most of the trade is taking place within the neighboring countries in the OIC bloc.

6 . CONCLUDING REMARKS

Over the last decades, there has been resurgence in the interest for globalization and how economic integration affects the co-movement of business cycles across countries. In this respect, this study looked at the multiple channels through which BCS is formed and examined some important transmitting channels such as trade intensity, intra-industry trade and economic similarities in economic structure, fiscal and monetary policies

in shaping BCS in the Islamic countries. In brief, the empirical results showed that:

- Trade integration is significantly the major factor of business cycle synchronization in the OIC countries, particularly during 1990-2005. So, the OIC countries with higher bilateral trade exhibit higher degree of BCS.
- Similarities in both fiscal and monetary policies had significant and positive effect on the OIC-BCS.
- Countries with more symmetric structures of production exhibited a higher degree of BCS.
- The intra-industry trade did not show to have any significant and meaningful effect on the OIC-BCS.
- Market size, common border and shared cultural joints (like common language) are shown to be the main determinants of trade integration in the Islamic countries.

According to the above findings, the following two issues need elaboration:

- First, although the fundamentals of creating a monetary union among Islamic countries have been addressed, its accomplishment seems to be a long and gradual process. Indeed, half century of effort put through by European countries for creation of monetary union is the proof of this claim. However, its initial step for the OIC should include active participation of Islamic nations for coordination of their economic, financial and monetary policies.
- Second, due to the lack of tendency or conditions of all member countries, formation of an OCA which encompasses all members seems to be unattainable for the years to come. The advancing trend in integration and the efficiency involved in regional arrangements, such as monetary union, requires a high degree of BCS which was a subject of emphasis in this paper. In addition, for establishing an OIC related OCA, even among a selected group of countries, the determining criteria of trade integration among OIC members should be dealt with seriously. Despite the advances made in areas such as transportation, international marketing, IT and electronic trade, the vastly scattered geographical location of OIC members is still one of the major hindering factors for trade integration with its significant impact on the BCS. Therefore, effectively establishing a monetary union in the short-run will face many fundamental and practical barriers. This is to indicate that the first step in enhancing the regional cooperation such as creation of a monetary union is subject to the immediate neighbors' serious efforts in this regard.

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