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SHANGHAI GROUP A TRADING PARTNER FOR DRAWING THE FUTURE OF ECONOMIC CONVERGENCE WITH IRAN

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ABSTRACT

Given the widespread and intense competition in the new global economic environment and due to the lack of preparedness in developing countries to compete in the international arena, the formation of trade blocks can greatly help the countries increase their competitive strength, and also improve the relative advantages of those countries having a membership in international trade. In the present study, the bilateral trade between Iran and member states of the Shanghai group has been investigated using spatial model measurement. The Group's countries have spatial correlation and the business climate of each country is affected by the neighboring countries. Both GDP and economic freedom index have positive and significant coefficients. Business cycle synchronization variable and population variable are negative and significant. The coefficient of the dummy variable DP, indicating the differences of liquidity growth of countries with a GDP growth, is negative and not significant. The results show that despite the lack of synchronization in economic cycles, economic integration is justifiable.

Keywords: Spatial Econometrics, Regional Integration, the Shanghai Group, Business Cycle Synchronization

INTRODUCTION

One of the most important features of the international system in today's world of globalization is the formation of regional convergence in the framework of international organizations and national efforts to eliminate tariff and non-tariff barriers in different parts of the world. Given the widespread and intense competition in the new global economic environment and given that developing countries cannot compete in the international arena without previous preparation; the formation of trade blocks can help countries to increase competitiveness, and strengthen the comparative advantages of member countries in international trade. (jalaee&derakhshideh,2014)

Among the different regional organizations established in this area Shanghai Cooperation Organization (SCO) in the Eurasia region has a significant effect and dynamic. The SCO was established in 2001 with the presence of China, Russia, Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan.Besides the main members, at first Mongolia in 2004 and a year later Iran, Pakistan and India were added to the organization as observer members. Nowadays, this organization with the geographical coverage of about 37 million square kilometers and a population of 2500000 with 20 percent of world's oil reserves and about 50 percent of world's gas reserves has undeniable capabilities and potentials.

Similarity and correlation of business cycles of countries that tend to be located within a block or economic cooperation can play an important role in economic integration between countries; in case of periodic correlation between member states of a block, the possible costs of using counter-cyclical economic policies will become minimum. Synchronization of business cycles means that the ups and downs of cycle are the same over time. Also, the meaning of synchronization of business cycles is the correlation between changes in GDP between the two countries in a period of time.

In order to estimate the economic convergence of Iran with the SCO spatial econometric measure is used. When in a research we have data which have a geographical component, general econometric methods are not that useful. Differences in spatial econometrics and general econometric are in the use of econometric techniques in sample data that has a spatial component. Considering the significance of this group in economic and political interactions in the global arena and the tendency of Iran to become a member of this group, in this study

we will investigate the economic convergence of this group of countries and the effects of business cycles synchronization on their economic convergence. Based on the mentioned issue, this study tries to answer the following questions: Is there any economic convergence between SCO countries and Iran? Does business cycle synchronization between Iran and the member countries improve economic convergence? Accordingly, to answer the questions, after the introduction the second part includes literature, the third part includes the specification, the fourth part includes the model estimation and finally the conclusion is presented.

2. Literature Review

First time in 1988, Professor Anselin presented a perfect framework of spatial econometric facts in the book called "Spatial Econometrics, Methods and Models". In the past few years enjoying this way has been taken into consideration by the scholars of the regional science. In the study of Beugelsdijk and Van Schaik (2005), they examined the relationship between social capital and economic growth in 54 regions of Europe using a spatial model survey and concluded that social capital has a significant positive effect on economic growth; So that a standard deviation of group activities increases the

economic growth to 0.03%. Barro and Sala (1991) studied the economic convergence of the states of America and achieved the convergence rate of the U.S. as 1.9%. Also, Barro (1997) studied the convergence of 114 countries and concluded that there is not absolute convergence between countries. He considered the reason as structural differences between countries. Conditional convergence coefficient in this study was 2.5.

Akbari and Farahmand (2005) in a study examined the economic integration among Muslim countries with an emphasis on the role of the Persian Gulf states. For this purpose spatial econometric methods were used. The results showed that the structural transformation of the global economy in recent years made the economies more dependent and made influence on each other. And economic cooperation can increase trade, Economies of scale, technology transfer and improvement of economic prosperity and growth. Akbari and Moallemi (2005) investigated the effects of economic integration in the countries of the Persian Gulf on the international trade flows. These countries have a common border and therefore spatial dependence between them have an impact on trade flows. Also, the coefficient of dummy variable of integration indicates the fact that the volume of trade

between countries in the Persian Gulf is less than the gravity model variables and to increase it, the countries must remove the trade barriers of cooperation contracts and use the potential and the benefits to each other. Najafi Alamdar and colleagues (2013) examined the Factors influencing the export of agricultural products in member countries of Eco in 1992 to 2008 using a model of the spatial model survey. The results indicate the spatial correlation between the countries. On the other hand, the GDP variables, exchange rates, and adjacent countries on agricultural exports have positive effects and the countries' population had a negative effect on it. Sameti and Behnud (2012) in a study entitled " the effects of economic instability on human development in selected Asian countries" examined the effects of inflation, unemployment, stagnation in production, budget deficits and exchange rate fluctuations on human development through geographically weighted regression approach on spatial econometrics as a branch of study in selected countries in Asia. The results show that due to the spatial data, spatial econometric is superior to general econometric and geographically weighted regression as a sub-branch of spatial econometric method to GLOBAL. The spatial anisotropy of exchange rate parameters and

budget deficits are confirmed but spatial dependence of human development has not been approved.

3. The clarification of model

In a set of sample data to mean that the observations in place I depend on other observation in place j. in other words:

$$i=1,2,3,4,5,…. ,n \qquad (6)$$

It is expected that the sample data observed at a point in space is related to the observed values in other locations.Conventional econometric technique that is based on assumptions of Gauss-Markov is flawed for regional studies. Research done in the area of the regional science, are dependent on sample data of the area that were collected due to the measurement location as a spot in space. In this case, the researcher faced with two phenomena in regional study data as: 1) the spatial dependence between observations, and 2) spatial heterogeneity.

3.1. Spatial Dependence

In a set of sample data to mean that the observations in place I depend on other observation in place j. in other words:

$$Yi = f(Yj) \qquad i=1,2,3,4,5,…. ,n \quad i \neq j$$
(6)

It is expected that the sample data observed at a point in space is related to the observed values in other locations.

3.2. Spatial heterogeneity

Refers to the deviation between the observations are related to the level of geographic locations. (Lessage 1999) linear relationship is depicted as follows:

$$Yi = f(X_i\beta_i + \varepsilon_i)$$

(7)

where i represents observations obtained in i=1,2,3,4,5,…. ,n points in space, xi represents Vector (k × n) from explanatory variables with parameters related to it, Yi is the dependent variable I the observation or place I, and Represents the random error. In general, the spatial anisotropy violates the linear relationship with constant variance exists between sample observations. If the equation changes with the move between the spatial sample data spatial econometric estimation models will model these changes.

3.3. Spatial lag

One of the basic concepts associated with space is spatial lag. Spatial lags are similar to the backward transfer in time series analysis and unlike the time series that lag occurs within the time, in spatial econometric interruption means the transmission over the space. So that epresents the first lag and represents the pth lag. The concept of spatial lag is used for the relations "neighbors than neighbors".

3.4. Diagnostic tests of spatial autocorrelation

Moran test: Is used to diagnose the spatial autocorrelation regression disturbing components. This test demonstrates the spatial correlation is disturbing in parts. Statistic Moran is achieved as follows.

$$I = \frac{e'We}{e'e}$$

(8)

Where e represents the regression disturbing components

Likelihood ratio and Wald test: These tests are used to test for spatial correlation in the disturbance components according to the difference between the likelihood logarithm of spatial error model and the likelihood logarithm of least squares regression.

Lagrange multiplier test: is conducted based on the residual least squares and calculation of the spatial weight matrix W. In this study to detect spatial autocorrelation in the disturbance components, Moran tests, likelihood ratio and Wald and Lagrange multiplier tests are used to identify the appropriate model to address spatial autocorrelation.

3. 5. First order spatial regression model (FAR)

The main application of this model is to detect the spatial correlation between neighbors. This model indicates the y changes

as a linear combination of latitude and longitude.

$$yi = \rho \sum_{j=1}^{n} W_{ij} y_j + \varepsilon i = \rho Wy + \varepsilon i \quad (9)$$

$$\varepsilon i \approx N(0, \sigma^2)$$

W contains information about latitude and longitude of the country. We introduced   as a spatial lag variable.

3.6. Mixed regression - autoregressive model (SAR)

In this model y is a linear combination of neighboring countries such as auto regression time series and since covariance in this model is not a diagonal matrix, estimation is done as inconsistent OLS and Maximum likelihood method is used in this model to estimate the parameters. The model is as follows.

$$yi = \rho \sum_{j=1}^{n} W_{ij} y_j + \sum_{K=1}^{K} \beta_k X_{ki} + \varepsilon i = \rho Wy + X\beta + \varepsilon i$$

$$(10)$$

$$\varepsilon i \approx N(0, \sigma^2 I_n)$$

3.7. Spatial Error Model (SEM)

Another one of the proposed models in spatial econometric is the spatial error model. In this model the dependent variable is affected by creating shocks in the neighboring countries. This model can be shown as:

$$yi = \sum_{k=1}^{k} \beta_k x_{ki} + \varepsilon_i = x\beta + u_i$$

$$u_i = \lambda W u_i + \varepsilon_i$$

$$\varepsilon i \approx N(0, \sigma^2 I_n)$$

3.8. Model

The simple form of the gravity model is defined as follows which has been adopted from the Newtonian gravity model. This model describes the distant gravitation between two or more substances. And asserts that the gravitational force between two materials is proportional to their weights and inversely proportional to the square of the distance between these two materials. To estimate international commercial flows in the simplest case where there is no obstacle and encouraging, using these models, bilateral trade flows can be considered as a direct function of economic size of the two countries and an inverse function of the geographic distance between the two countries:

$$Tij = C \frac{GDPi.GDPj}{Dij} \quad (1)$$

Although the gravity equation initially did not have theoretical basis, but relatively large R2s have led many researchers to use the gravity equation as a measure for bilateral trade volume. For the first time, the gravity model was proposed to measure certain bilateral trade examples and to justify commercial blocks and then it was also used to examine the effects of regional integrations on foreign reciprocal investment. In its simplest form, the gravity model was originally developed by Tinbergen (1962) in economics which is

directly derived from Newton's theory of gravity.

$T_{ij} = c_1 + c_2 Y_i + c_3 Y_j + c_4 POP_i + c_5 POP_j + c_6 Dcu + c_7 Dlan + c_8 Dd + \ldots + U_{ij}$ (2)

In this equation, Tij is exports (imports) of country i to (from) j, Yi is income of country i, Yj is income of country j, POPi is population of country i and POPj is population of country j which appear as explanatory variables on the right side. Yi and Yj are considered as mass variables in Newton's relation and demographic variables are two other scale variables. Following these variables, a set of dummy variables will be added to explain other effects on reciprocal trade flows between the two countries. Dcu is the dummy variable added to explain the other effects of the two countries' mutual trade blocks. Dlan is the dummy variable for the common language between the two countries and Dd is the dummy variable related to the distance or proximity of the two countries.

The model used in this paper is generalized gravity model and is specified as follows:

For estimating, the model can be explicated as follows:

$XM_{ij} = \alpha_0 (GDP)^{\alpha_1} (POP)^{\alpha_2} (SYN)^{\alpha_3} (HER)^{\alpha_4} (DP)^{\alpha_5}$ (11)

$\ln XM_{ijt} = \alpha_{ij} + \alpha_1 \ln GDP + \alpha_2 \ln POP + \alpha_3 SYN + \alpha_4 HER + \alpha_5 DP + U_{ijt}$

XM: exports plus imports of the country at time t and shows the bilateral trade flows between exporter countries (i) and the importing countries (j). αij: an abscissa that represents the specific effects of each of the partner countries and may vary depending on the trade orientation. GDP : real GDP of country at time t which express the country's economic size.. POP: Indicate exporter and importer countries populations which will represent the size of the market. Because this variable is effective on the market size and economies due to scale, it will have uncertain effects on bilateral trade flows.

SYNCHij: Indicator of trade cycle synchronization between countries i and j. Kalemli-Ozcan, Sebnem. Elias, Papaioannou. luis, Peydro (2009) have calculated it as follows:

$$SYNCH_{ijt} = -\left|(LnY_{i,t} - LnY_{i,t-1}) - (LnY_{j,t} - LnY_{j,t-1})\right|$$ (5)

in which is the real GDP of country i at time t and is the real GDP of country j at time t. The more the value of this index in terms of the algebra and the closer to zero is, the greater would be the synchronization of trade cycles between the two countries.

According to Mandel and McKinnon, the synchronization of trade-cycles is a

precondition for integration and cooperation of countries into a regional trade agreement; because the possible cost of anti-cycle economic policies are reduced with simultaneous trade cycles.

4. Estimating the Model

Estimation of spatial econometric model

According to the specified model, the following steps are taken to estimate the model:

4. 1. Moran, likelihood ratio and Wald tests

The null hypothesis in all three tests is the absence of spatial autocorrelation in disturbing components and since the Moran statistic value is greater than 1.96 and the likelihood ratio and Wald statistic values are greater than 6.635, the null hypothesis is rejected. By rejecting the null hypothesis as the lack of spatial autocorrelation, spatial econometrics can be used **(Table 1)**.

4.2. Lagrange multiplier tests

The null hypothesis of lmerror and lmlag tests is the lack of spatial correlation in disturbing components and the lack of spatial dependence in the dependent variable observations. Test results in **Table 2** show that the SEM model should be used to remove the disturbing elements of spatial autocorrelation.

4.3. Hausman test

In this section likelihood-ratio (LR) test is used to choose between one of the two models including the Pool model and panel data method. In case of choosing the panel model, Hausman probability test is used for choosing between fixed effects and random effects (Elhorst, 2011). Based on the results obtained from these two tests, due to the lower LR probability and higher Hausman probability (more than 0.05) we should use the panel model with random effects.

4. 3. Estimation of FAR model

The results of estimating equation in **Table 3** show that the spatial coefficient ρ is equal to 0.9779, which is statistically significant and indicates the positive spatial correlation among the countries.

Table 1: Results of Moran, likelihood ratio and Wald tests

statistic	coefficients
Moran I-statistic	2.7419
Probability	0.0061
Lratios	9.8962
Probability	0.0017
Walds	39.9133
Probability	2.6549e-10

Table 2: Lagrange multiplier test

statistic	coefficients
Lmerror	6.2414
Probability	0.0125
Lmlag	0.0087
Probability	0.9255
Lmerror_robust	6.9498
Probability	0.0084
Lmlag_robust	0.7172
Probability	0.3971

Source: Calculations of the researcher

Table 3: Hausman test

statistic	coefficients
Probability of LR	0/0000
Probability of Hausman test	0/8290

Source: Calculations of the researcher

**Table 4: The results of estimating FAR model**

test	coefficients
ρ	0.9779
Asymptot t-stat	166.9694
z-probability	0000/0

Source: Calculations of the researcher

Table 5: The results of estimating of SEM model

variable	coefficients	t-statistics	Possibility
constant	0.1814	0.1910	0.8484
LNGDP	0.950	21.73	0/000
LNPOP	-0/120	-1/97	0/048
SYN	-0/512	-2/603	0/009
HER	0/684	3/740	0/000
DP	-0/006	-0/180	0/856
λ	0/543	7/601	0/000
θ	1/360	2/098	0/035
			R2=0.99

Source: Calculations of the researcher
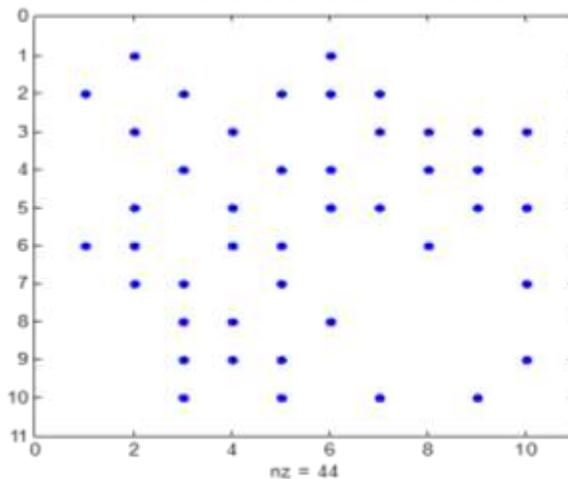
4.2.4. Estimation of SEM model

4.4 Drawing the Weighted Matrix

In order to estimate the model a standard weighted matrix is needed which shows the spatial dependency among the selected countries. Hence, in order to form this square matrix with the dimensions of T*T (T indicates the number of cross-sections), the longitude and latitude information is used and for each country a row and a column are considered so that based on longitude and latitude coordinates, the distance between each country with its neighboring ones can be determined. The two dimensional expression of the utilized matrix with the dimensions of 10*10 is investigated in order to show the spatial relation of the selected countries.

Table 5 represents the results of estimating the following equation.

$$\ln XMt = \beta 0 + \beta_1 \ln(GNP)_t + \beta_2 \ln(POP) + \alpha_3 (SYN)_t + \beta_4 (HER) + \beta_5 (DP) + Ut$$
$$(14)$$
$$u_t = \lambda(wu_t) + \varepsilon_t$$
$$\varepsilon i \approx N(0, \sigma^2 I_n)$$

The results shown in this table indicate the positive and significant coefficient of λ which indicates the sensitivity of each country's trade status to its neighboring countries.

According to Table (5), the general results of estimation with R2 more than 99 percent indicate the fact that the model was able to explain the mutual trade flows between Iran and the SCO countries. Statistically speaking, the coefficients are assessed in the 95% significance level.

GDP is used as an indicator for the economic size of business partners. Considering the obtained results, GDP has had a significant role in determining the trade volume of Iran and its coefficient is positive, which conforms to the research hypothesis. The estimated coefficient indicates that, while keeping the other variables constant, a one-percent surge in the GDP of member countries explains average 95 percent of mutual trade flows of Iran. This leads to an increased foreign trade and more attraction of foreign products. Hence, the foreign trade of the country increases. The variable of population is significant with a negative sign. The negative sign of this coefficient shows that countries with higher population can better use the economic measure resulted from their domestic markets and they tend to pay more attention to domestic production. The variable for business cycles synchronization(SYNCHIJ) has a negative sign. Hence, the effect of business cycles synchronization on the mutual trade volume of the selected countries is a reverse effect and business cycles synchronization has a negative impact on economic convergence and the higher the business cycles synchronization among the member countries is, the lower the possibility of economic convergence. The measure for economic

openness, Heritage, is a detailed analysis on the factors which have the highest contribution to the institutionalization of economic growth and the majority of the current theories on the roots and factors of economic development can be seen in this measure. Based on the research results, the coefficient of this measure is significant and positive and indicates the fact that economic liberties have a significant role in the trade volume among the member countries. The coefficient for the virtual variable of DP which indicates the difference between the liquidity growths of the countries along with GDP is negative and it's coefficient is not statistically significant.

CONCLUSIONS

The developing countries are not able to compete in the global arena without necessary preparations. The formation of trade blocks can be a significant help for countries in order to increase their competitive capability. Hence, the current study investigates the mutual trade flows between Iran and the member countries of SCO, using the spatial econometric model. The explanatory power of the model as well as the positive and significant coefficient of GDP indicates that the economic convergence of Iran with the SCO countries is economically justifiable. Since the variable of business cycles

synchronization utilized in the model has a negative sign it can be concluded that despite the lack of cycles synchronization, the economic convergence is justifiable. Moreover, the positive and significant coefficient for the measure of economic openness emphasizes the economic convergence of Iran and the SCO members.

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