Iran's Trade Modification Under Sanctions: An Evidence of Trade Divergence and Trade Convergence Through the Gravity Model

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This paper uses a panel exports/imports gravity model to investigate Iran's trade pattern with its 50 top trading partners from Europe and Asia under sanctions. The empirical data are obtained from each of the 50 Iran's trade partners over the period 2006 to 2015. The main purpose of this study is to find out how Iran's trade pattern has been changed by sanctions. The empirical evidence revealed a significant negative effect of sanctions on Iran-EU bilateral trade (by an average of 38.1% on the Iran's export to the EU and 45.8% on the Iran's import from the EU), while it has a positive impact on trade between Iran and the Asian countries (by an average of 92.3% on the Iran's import from the Asian countries and by 77.4% on the Iran's export to these countries). Totally, these findings proved that the imposition of sanctions related to the Iran's nuclear program pushed the foreign trade policy of this country towards the Trade Convergence (TC) with Asia (Asianization) and Trade Divergence (TD) from the EU (Europeanization).

Keywords: Sanctions; Trade Convergence (TC); Trade Divergence (TD); Gravity trade model; Iran.

1. Introduction

A historical review of economic sanctions shows that sanctions imposing by countries may affect the trade pattern of a target country. It is widely believed that imposed sanctions raise trade costs in target or sanctioned country which would be a limitation for trade development of the country. However, to decrease the trade cost, a sanctioned economy may modify its trade direction from the sanctioning countries (Those countries who impose sanctions against a target country) to the rest of the world. This modification of trade direction is one of the most

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popular anti-sanctions policies in countries who suffer under economic sanctions. Furthermore, modification of trade direction under economic sanctions may lead to Trade Divergence (TD) and Trade Convergence (TC). These two concepts are defined for the first time in this research. We consider TD and TC as the results of sanctions on the trade pattern of a target country- TC means trade volume of the target country with a group of nations goes up over a period of time, while TD appears when trade volume between sanctioned country and a group of nations decreases over time.

Iran is one of the most Asian economies affected by various rounds of sanctions imposed by different nations, particularly the US and the EU. The history of imposing sanctions against Iran dates back to the oil nationalization of this country in 1951 and the last round of serious sanctions against this country started in response to the Iranian nuclear program in January 2006 and stopped in July 2015 when Iran and the P5+1 signed an international agreement, called the Joint Comprehensive Plan of Action (JCPOA). Over the period 2006-2015, Iran tried to imply the modification of trade direction from the sanctioning countries, particularly the EU (we call this trade shift: de-Europeanization) to the rest of the world, particularly Asia (we call this trade strategy: Asianization) in order to reduce the negative effects of sanctions on its trade flows. In other words, the last round of sanctions against Iran led to the TD of Iran from the EU (de-Europeanization) and the TC of this country with Asia (Asianization).

Although the trade flow of Iran has drawn some attention from researchers such as Fahimifard (2013), Suvankulov and Guc (2012), Soori and Tashkini (2012), Taghavi and Hosein Tash (2011), Esmaeili and Pourebrahim (2011) and Kalbasi (2002), the author did not find any study considering the effects of sanctions on Iran's bilateral trade with the EU and Asian countries through a gravity model.

Since there has not been any study to investigate empirically what happened for the Iran's trade pattern under the nuclear program sanctions, in this paper, we attempt to use a gravitational model of international trade to investigate the bilateral trade pattern between Iran - 25 EU member states and Iran-25 Asian countries during the period 2006 to 2015. The choice of these countries in this study is based on the

ranking of most Iran's regional trade partners by IRICA (The Islamic Republic of Iran Customs Administration). Therefore, investigating the bilateral trade pattern between Iran and these countries in Asia and the EU can highlight the existence of the TC (Iran's trade policy of Asianization) and the TD (de-Europeanization) under sanctions. According to the increasing imposition of economic sanctions in the world economy, the results of this study would be expected to be useful for all sides of sanctions: sanctioned country, sanctioning nations and the rest of the world.

Our main hypotheses based on the objective of our research are as follows:

   HI:

H0: The sanctions against Iran led to the TD of this country from the EU (de-Europeanization).

H1: The sanctions against Iran did not lead to the TD of this country from the EU (Europeanization).

   HII:

H0: The sanctions against Iran led to the TC of this country with Asian countries (Asianization).

   H1: The sanctions against Iran did not lead to the TC of this country with Asian countries (de-Asianization).

2. Overview of sanctions against Iran

Iran is one of the largest economies in the MENA[1] region and the Islamic world based on its nominal GDP (367.098 billion $ in 2013), member of N-11 (Eleven countries with a high potential to become a large economy) and 18th economy in the world (based on her PPP in 2013). The economy of Iran has experienced various long-run nasty sanctions since 1951 when Iran nationalized its oil industry till the unprecedented nuclear program sanctions imposed by the United Nations and Western countries from 2006 up to 2015 when the Joint Comprehensive Plan of Action (JCPOA) on the nuclear program of Iran

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1- Middle East and North Africa.

was signed by Iran and P5+1. According to this agreement, Iran restricted its nuclear program in exchange for the energy, trade and financial sanctions relief.

Generally, the history of the imposition of sanctions against Iran dates back to the 1951- Iran's Oil Nationalization when due to the trying of this country to nationalize its oil reserves which were under control of the Anglo-Iranian Oil Company, the western countries imposed economic sanctions on Iran and prevented purchases of Iranian crude oil on the international markets (Katoozian, 1993). The next noticeable sanctions were imposed by the USA for the reason of the Hostage Crisis after the Islamic revolution of Iran in 1979. The main sanctions by the USA were freezing Iranian government assets in the United States and preventing oil imports from Iran to the USA. Furthermore, Iran experienced another round of sanctions by the western countries during the Iraq-Iran war in 1980-1988 and in 1996 when the USA approved the package of the Iran and Libya Sanction Act (ILSA) which restricted international firms doing business with Iran and Libya. The last round of economic sanctions begun when the UN security council passed a number of resolutions in 2006 concerning the nuclear program of Iran. The sanctions related to the Iran's nuclear program have been developed since 2010/2011 by the western countries, particularly the EU and the USA, which multiplied the pressure on the Iran's economy.

Reviewing the history of imposing various sanctions on Iran depicts that over the years, this country could increase its speed of adoption and domestic capacity under any global restrictions. In other words, despite the negative effects of sanctions, economy of Iran survived among all these embargoes and improved efficiency of its response to the international pressures. The overall Iran's economic policies and strategies in response to the sanctions are directed by the Iran Resistive Economy Method (IREM). IREM's principles direct Iran to go to reach a higher level of resource allocation efficiency, increase the capacity of national productions, and improve the business climate to turn the sanctions into economic opportunity.

Historically, since the beginning of 2000s, Iran has performed and developed various strategies such as the Oil Stabilization Fund (OSF) establishment, FDI liberalization, fuel basket liberalization, trade partner

diversification, import substitution, national support for domestic strategic industries, expansion of private sector capacity etc., to strengthen and promote its economic stability and capacity under any unpredictable circumstances like sanctions. To harmonize all these anti-sanctions policies, the IREM for the first time was introduced in 2009 (Jabalameli and Rasoulinezhad, 2012) and its completed version with the main principles were announced by the Iran's supreme leader in 2013.

Among several IREM principles such as knowledge-based economy, improving total factor productivity, increase transparency of financial matters, trade is considered as one of the most important features of IREM. Hence, under various strategies of IREM (e.g. import-substitution strategy, promoting exportable goods, increasing regional and international economic collaboration and promoting domestic strategic products), Iran tried to mitigate the negative consequences of sanctions on its trade flows.

One of the main results of the above strategies of IREM can be highlighted by the contributions of oil and non oil industries to the Iran's GDP. Despite the consideration of oil industry as the magnitude sector of the Iran's economy, due to the several sanctions, the oil industry experienced a declining share from near 27% in 2006 by roughly 17% of GDP in 2013. The following figure shows the contribution of oil and non-oil industries to the Iran's GDP during 1994–2013. As shown in Figure 1, the share of the oil industry started to decrease from 2006/7, while this country tried to improve its non oil industries in order to reduce its dependency on oil revenues and as a result, the contribution of non-oil industries to GDP of this country gradually increases over the period 2006-2013.

Figure 1. Share of oil and non oil industries in GDP of Iran during 1994–2013, %
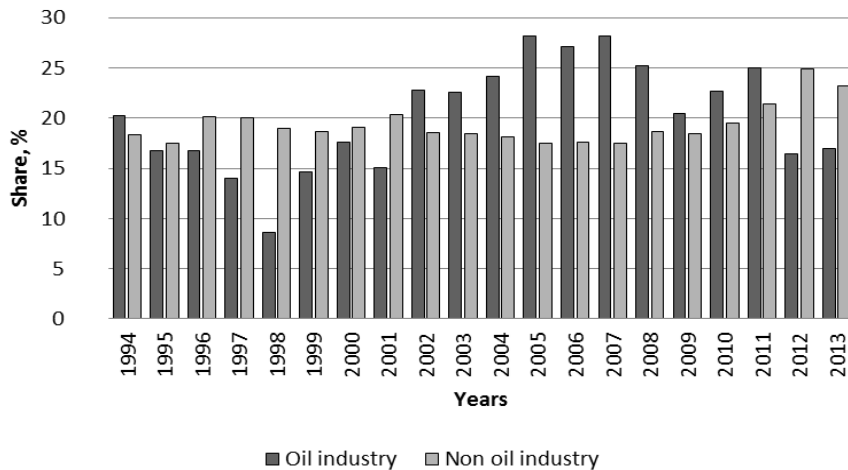
Source: Authors' compilation from the Central Bank of Iran

Another noticeable result is the shift of Iran's trade partners in the way that Iran gradually began to expand her trade with Asian nations and reduce trade relations with the European Union members. Generally, we can express there has been the Trade Convergence with Asia (Asianization) and the Trade Divergence with the EU (de-Europeanization) under sanctions. In the case of foreign trade direction, Iran has switched its relations from European region towards Asia. The shift of Iran's trade was caused mainly by imposition of the numerous sanctions as well as by GDP growth of some Asian nations such as India and China. Historically, in the early of 2000s, Iran focused on trade with European countries, particularly Germany, but since 2006, Iranian exports to various Asian countries such as Japan, China, India and South Korea have been expanded due to the imposition of nuclear-related sanctions against Iran and also considerable potential of the Asian markets. Furthermore, Iran has found some new markets such as Iraq, Afghanistan and Pakistan for its non-oil products. The following table reports the trade growth between Iran and five Asian countries, i.e. UAE, India, China, Turkey and Taiwan in 2006 and 2013. It can be seen that the volumes of Iran's exports and imports to/from these nations have noticeably grown between 2006 and 2013. In addition, a remarkable point here is that the growth of Iran's exports to these five Asian countries is higher than her imports from them. It can be a sign of improving the export capacity of Iran under sanctions.

Table 1: Bilateral trade between Iran and some Asian countries in 2006 and 2013 (Million $)

Countries	Iran's Exports			Iran's Imports		
	2006	2013	Growth,%	2006	2013	Growth,%
UAE	1728.11	4210.12	143.6	9349.48	10625.62	13.6
India	836.64	2623.82	213.6	1440.22	2047.79	42.1
China	1053	5513.18	423.5	2752.82	8181.44	197.2
Turkey	326.08	1477.73	353.1	889.52	4551.15	411.6
Taiwan	125.79	250.6	99.2	390.05	492.25	26.2

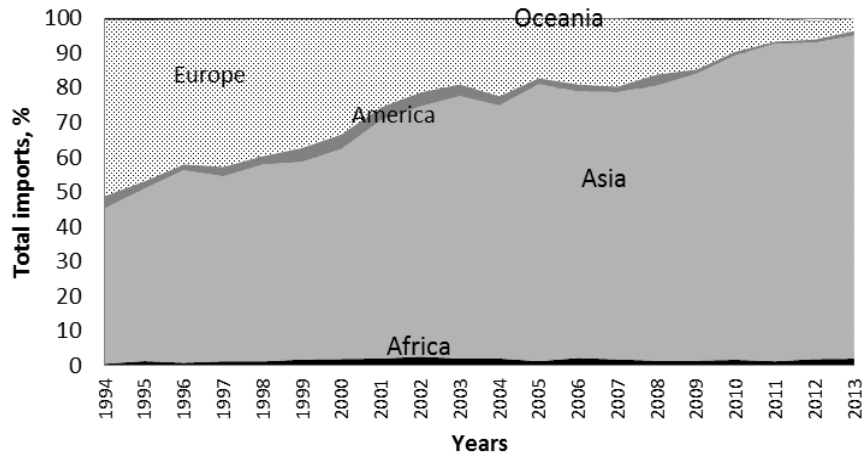**Source:** Authors' compilation from the Central Bank of Iran

To compare the trade direction changes of Iran over the years, Figure 2 and 3 are presented. These figures represent the trade shift of Iran in both cases of imports and exports. As it can be seen from the figures, Iran has reduced its imports from Europe and ramped up its purchasing from Asian nations. This shift similarly has been performed in regard to the Iran's exports and thus Iran's share of imports of Asia has risen up over the period of 1994 to 2013. However, as we mentioned before, the intensification of Iran's exports to Asia in 2006 was the response to the remarkable increase and expansion in imposing horrific sanctions against Iran. Since 2006, Iran gradually has replaced the European oil consumers with several new oil and gas importers in Asia. Over time, Asian countries have become generally larger buyers of Iranian energy and non energy goods than the European region.

Figure 2: Total exports to Iran during 1994–2013, %
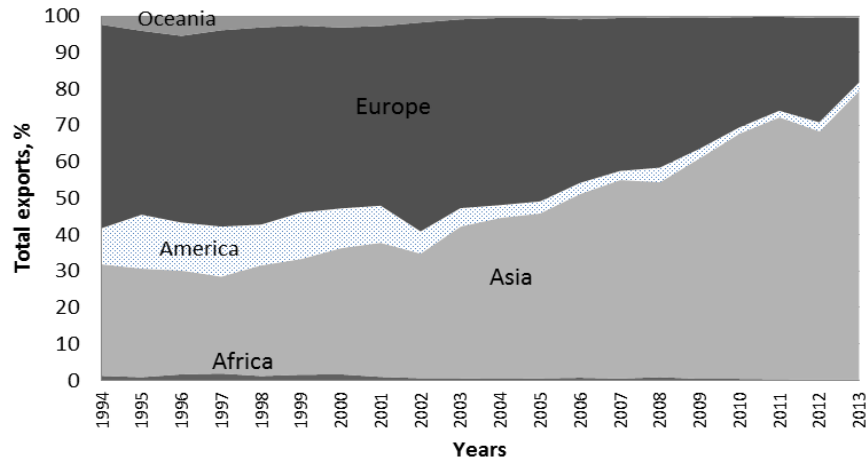
Source: Authors' compilation from the IRICA.

Figure 3: Total imports from Iran during 1994–2013 (in %)

Source: Authors' compilation from the IRICA.

3. Literature review

In this senction, we divide the related literature into three strands of
study: (i) consideration of sanctions' effects on foreign trade of a certain
country; (ii) investigation of the effects of sanctions using the gravity-

trade theory; and (iii) exploring the effects of sanctions on Iran's trade flows.

The first strand of literature attempted to find out how sanctions affect trade flows of a sanctioned or sanctioning country. Dollery (1993) attempted to make a survey on effects of sanctions against South Africa by using a general equilibrium analysis. The research results indicated that for small developing economies, trade sanctions have a greater share of the sectoral burden on the labor-intensive exportable sector. Barrett (1997) explored the strategy of trade sanctions in international environmental agreements. He found that the credible threat to impose trade sanctions may be capable of sustaining full cooperation in the supply of the public goods. In a study, Tian and Whalley (2010) discussed the relationship between trade sanctions, financial transfers and BRIC economies participation in global climate change negotiations by using a general equilibrium model. Their results showed that only very high tariffs of over a hundred percent by all other countries could induce participation by BRIC economies. Lamotte (2012) had an attempt to find out the effects of wars and sanctions on trade in the case of the former Yugoslavia. His findings revealed a negative relationship between sanctions and trade. Moreover, the effect of the sanctions on trade flows is more significant than the impact of war. Venkuviene and Masteikiene (2015) studied the impact of economic sanctions against Russia on the Central and Eastern European (CEE) countries business environment through literature analysis and synthesis. They concluded that in the CEE the most suffered production sectors from the Russian sanctions is the dairy sector, following by the meat sector. Aalto and Forsberg (2016) investigated Russia's geo-economy under the economic sanctions. They showed that the sanctions significantly hamper new greenfield projects in Russia's emerging energy provinces. Moreover, low oil prices since mid-2014 shape existing fossil fuels trade more than the sanctions, which have no impact on Russia's arms exports.

The conclusion of most of the mentioned studies in the first strand is that economic sanctions influence trade flows between countries.

In the second strand of the study, the authors concentrated on investigation of sanctions' effects through the gravity-trade theory. Van Bergeijk (1992) tried to investigate the effects of diplomatic climate on

the bilateral trade flows of 40 countries in the year 1985. His findings proved the hypothesis that political cooperation and hostility among countries shape the pattern of international trade. Hafbauer et al. (1997) investigated sanctions' effects through a gravity model for 88 countries in three different years of 1985,1990 and 1995. Their results revealed negative impact of sanctions on bilateral trade flows by nearly 90%. In other study, Caruso (2003) analyzed the impact of international economic sanctions on trade between the US and 49 target countries through a gravity model over the period 1960-2000. The estimation results showed a large negative impact of sanctions on bilateral trade. Yang et al. (2004) applied a gravity trade model to explore the findings of economic sanctions. Their main results proved that success of sanctions is most easily achieved when pre-sanction relations between sender and target are cordial or neutral. In other research, Yang et al. (2009) developed the gravity trade model used by Yang et al. (2004) to investigate whether the EU is an alternative market for nations when they are confronted with the US sanctions. The findings revealed that after the imposition of sanctions by the US, the EU gradually captured trade flows from the sanctioned nations. Lastly, Mehchy et al. (2015) had an attempt to find out how sanctions affected Syrian exports between 1995 and 2010. The ajor result of their gravity-trade estimation expressed that sanctions and the deterioration in institutional factors have reduced Syria's export potential by more than 70%.

Considering the studies in the second strand, it can be concluded that the gravity trade model is a convenient method to find out the effects of sanctions on trade flows.

The last strand of research consists of studies about the effects of sanctions on Iranian economy,particularly its trade flows. Torbat (2005) presented the case study of Iran to explore the effectiveness of the US unilateral trade and financial sanctions. His major results expressed that the unilateral import sanctions on the fungible crude oil have been ineffective.Schott (2012) had an attempt to provide background and history of economic sanctions on Iran and focused on the effectiveness of the sanctions as well. He concluded that coalition and cooperation of sanctioning nations are important to maintain the effectiveness of the sanctions against Iran's trade flows.Shirazi et al. (2016) examined the effects of sanctions in the three years of 2012,2013, and 2014 using a

fixed effect gravity model. Their major finding is that the effects against Iran have had a significant and negative effect on the amount of export and the Iran's export flows has fallen annually by 33 percent in average. In other study, Setayesh and Mackey (2016) investigated the effects of sanctions on Iran's public health. Their main results showed that the limitation on medical imports due to the sanctions created vital domestic shortages of medical products which forced the country to import of medicines that are of lower or questionable quality. Moreover, Lanchovichina et al. (2016) applied a global general equilibrium simulation model to find out the effects of lifting sanctions on iran with and without strategic responses. Their findings revealed that iran benefits the most with average per capita welfare gains ranging from close to 3 percent and furthermore, Iran's crude oil exports to the EU recover to half their preembargo level. Haidar (2016) explored the relationship between sanctions and export deflation in Iran over the period 2006-2011. His estimation results concluded that two-thirds of the Iranian export volume deflected towards the non-sanctioning countries. Gharehgozli (2017) used the synthetic control method to estimate the effect of international trade on Iran's economy. The results showed that the Iran's economy, particularly its GDP and trade, suffered a hit of more than 17% in the period between 2011 and 2014. .

Overall, it can be seen that there has not been a serious attempt to examine the Trade Convergence or Trade Divergence of Iran under sanctions pressure. Hence, this paper would provide new and useful results for policy makers and scholars.

4. Data description and methodology

4.1 Dataset description

This study covers bilateral trade between Iran and its trade partners consist of 25 EU member countries (Austria, Belgium, Cyprus, Czech Republic,Denmark, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Hungary, Latvia, Lithuania, Luxembourg, Malta, The Netherlands, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, the United Kingdom), and 25 Asian countries (Afghanistan, Bangladesh, China, India, Indonesia, Iraq, Japan, Kuwait, Lebanon, Malaysia, Nepal, Oman, Pakistan, Philippines, Singapore, South Korea, Syria, Taiwan,

Tajikistan, Thailand, Turkey, Turkmenistan, the UAE, Uzbekistan and
Vietnam) over the period 2006 to 2015. The variables used in this study
comprise import and export flows between Iran and the countries in
thousand U.S. dollars, GDP in thousand U.S. dollars, geographical
distance between capital cities of Iran and the trade partners in
kilometers, urbanization growth in Iran and trading partners, the
composite trade intensity (CTI) in percent, GDP weighted average of
distance as a proxy for Multilateral Resistance Term (MTR) , accession
to the WTO and sanctions as dummy variables. The source of the data
on import and export flows is IRICA. The data on GDP and primary
data to calculating CTI are collected from the World Bank and the
World Economic Outlook Database (IMF, 2015). Data for distance
between countries were gathered from the GeoDist database (CEPII,
2015) .

Furthermore, all the time-variant series level are transformed in to
natural logarithms, based on the advantages of this form than using the
level of variables (Wooldbridge, 2013).

Table 2: The variables of model

Variables	Definition	Unit
Import	Import flows between Iran and trade partners	Thousand US $
Export	Export flows between Iran and trade partners	Thousand US $
Y	GDP in Iran and trade partners	Thousand US $
URB	Urbanization growth in Iran/urbanization growth in trade partner	%
DIS	Distance between capitals of Iran and trade partners	Kilometers
REMO	Multilateral Resistance Term (MRT)	-
CTI	The CTI in Iran/ the CTI in trade partner	%
WTO	Dummy variable capturing a value of one if Iran and a trading partner belong to the WTO	Dummy (0/1)
Sanctions	Dummy variable taking a value of one if there are sanctions against Iran	Dummy (0/1)

4.2 Model specification

Following Baldwin and Taglioni (2011), we can theoretically represent
the gravity trade model in a CES form as:

$$v_{od} = \left(\frac{P_{od}}{P_d}\right)^{1-\sigma} E_d; \quad \sigma > 1 \tag{1}$$

In Eq. (1), V_{od} denotes the expenditure in country-d, P_{od} represents the consumer price in nation-d, P_d shows the nation-d CES price index and σ indicates the elasticity of substitution, while E_d is the nation-d consumer expenditure.

Considering the profit maximization exercise of producers based in nation-o and Dixit-Stiglitz monopolistic competition, we have:

$$v_{od} = n_o {p_{oo}}^{1-\sigma} \frac{\tau_{od}^{1-\sigma}}{P_d^{1-\sigma}} E_d \tag{2}$$

Where V_{od} represents the aggregate value of the bilateral trade flow from nation-o to nation-d and n_o indicates the mass of nation-o.

By means of some assumptions based on Baldwin and Taglioni (2011), our gravity equation is:

$$v_{od} = \tau_{od}^{1-\sigma} E_d Y_o \frac{1}{P_d^{1-\sigma}} \frac{1}{\Omega_o} \tag{3}$$

In this gravity equation, P_d and Ω_o indicate the nation-d CES price index and nation-0 market potential index, respectively. Furthermore, we can call $P_d^{1-\sigma} \Omega_o$ as the MTR (Multilateral Trade Resistance) term. Nation-d's economic size is a proxy for E_d, while Y_d is proxied with nation-o's economic size. τ can be proxied with bilateral geographical distance.

Besides the theoretical formation of our gravity model, we have to develop an econometric gravity equation based on our theoretical background. The earliest form of the gravity model which was introduced by Tinbergen (1962) has the following structure:

$$lnExport_{ij} = \beta_0 + \beta_1 lnY_i + \beta_2 lnY_j + \beta_3 lnDIS_{ij} + \varepsilon_{ij} \tag{4}$$

Where the export volume of country i to j ($lnExport_{ij}$) has a relationship with the GNP in country i (Y_i) and in country j (Y_j), meanwhile the distance between countries i and j (DIS_{ij}) as a proxy for transportation cost.

Despite a vast number of developing gravity model of Tinbergen (e.g. see Chen and Wall (1999); Anderson and Wincoop (2003) and Guttmann and Richards (2004), Rasoulinezhad and Kang (2016), Popova and Rasoulinezhad (2016) and Rasoulinezhad (2016, 2017)), we use a gravity model with some new variables in order to analyze bilateral trade flows between Iran and trade partners in the EU and Asia to find out the effects of sanctions on Iran's trade pattern.

Moreover, while in the perior gravity models scholars always used simple trade openness, we substitute it with the composite trade intensity (CTI) which was introduced by Squalli and Wilson (2006) and is calculated as follows:

$$CTI_i = \frac{n(X+M)_i^2}{GDP_i \sum_{j=1}^{n}(X+M)_j} \qquad (5)$$

In the above equation, X+M denotes the trade of a country. It should be noted that the common trade openness formula comprises a one-dimentional measures of trade openness, while CTI contains both the relative position of country's trade flow compared to its economic size and also the importance of country's trade flows to gloval trade flows (Elmorsy, 2015).

In addition to the CTI, our gravity model consists of the variable Multilateral Resistance Term (MRT) which was firstly represented by Anderson and Wincoop (2003) in a gravity model with a CES structure as:

$$x_{ij} = \frac{y_i y_j}{y^w}\left(\frac{t_{ij}}{\pi_i P_j}\right)^{1-\delta} \qquad (6)$$

Where x_{ij} indicates nominal export from country i to trade partner j, y_i shows nominal income of country i and y^w denotes world income ($=\sum_j y_j$). δ represents the elasticity of substitution across goods and t_{ij} is international trade costs. According to the Anderson and Wincoop (2003)'s argument, π_i and P_j are multilateral resistance variables. According to Baier and Bergstrand (2007), GDP weighted average of distance from trading partners can be used as a proxy for the multilateral resistance term.

Comprising only the time-variant variables (variables that change over the time) the gravity trade models in the cases of export and import flows can be formulated as follows, as:

$$lnexport_{ijt} = \delta_1 + \delta_2 \ln(Y_{it}Y_{jt}) + \delta_3 \ln CTI_{ijt} + \delta_4 lnurb_{ijt} + \delta_5 REM_{ijt} + \varepsilon_{ijt}$$
$$lnimport_{ijt} = \delta_1 + \delta_2 \ln(Y_{it}Y_{jt}) + \delta_3 \ln CTI_{ijt} + \delta_4 lnurb_{ijt} + \delta_5 REM_{ijt} + \varepsilon_{ijt}$$

(7)

Where Export and Import denote export and import flows between Iran (country i) and a trading partner (country j) at specific time t, respectively. $Y_{it}Y_{jt}$ represents the economy size of Iran and trading partner j at time t. Moreover, urb_{it} shows urbanization growth, while REM and CTI indicate the MTR and composite trade intensity at time t, respectively.

The above gravity equation only comprises time-variant variables, while it consists some time-invariant variables (variables that do not change over the time), i.e. distance, WTO and sanctions:
Time-invariant variables:

$$\delta_6 \ln DIS_{ij} + \delta_7 sanctions + \delta_8 WTO + \varepsilon_{ijt}$$
(8)

Here, Dis_{ij} shows the geographical distance between capital cities of Iran (country i) and a trading partner (country j). Meanwhile, variables sanctions and WTO are dummy variables which are captured bi-nominal variables. Variable "sanctions" takes a value of 1 if there are sanctions against Iran or takes 0 otherwise and WTO captures a value of 1 if Iran or its trading partner belongs to the WTO.

Based on the theoretical framework of the gravity model of international trade, it is expected that economy size (GDP) would have positive impacts on trade volume and accelerate trade flows growth between Iran and trading partners. It is also expected that the coefficient of the openness level (CTI) and urbanization growth may be positive. In the case of MTR (REM), trade volume may be enhanced for the higher multilateral resistance of the exporter i. In regards to the time-invariant

variables, the coefficient of DIS is expected to bear a negative sign as geographical distance shows the transportation cost between Iran and a trading partner. Since due to the imposed sanctions by the EU, we expected that the sign of sanctions would be negative in trade flows of Iran with Europe, while it would have a positive sign in trade flows of Iran with Asian trade partners. Furthermore, since accession to the WTO may create a new trade opportunities, the coefficient of WTO in our model would be expected to bear a positive sign.

5. Estimation results and discussion

5.1 Panel-Based Cross-section Dependence Test

In panel data analyzing, cross-section dependence test that shows whether the sample data are cross sectional dependent or independent, should be applied before stationary test of variables. Otherwise, following Breusch and Pagan (1980), the estimation results are more likely in biased and inconsistent situation. Considering the time and cross sections in our study, the Pesaran residual cross-section dependence (CD) test is computed as follows:

$$CD = \sqrt{\frac{2}{N(N-1)}} \sum_{i=1}^{N} \sum_{j=i+1}^{N} \sqrt{T_{ij}} \hat{\rho}_{ij} \qquad (9)$$

Table 4 reports the results of the CD Persaran test. It can be seen that the null hypothesis (No cross-section dependence in residuals) can be strongly rejected at the 5% level. It implies that all series have strong evidence for cross-sectional dependence.

Table 4: Pesaran (2004)'s CD test results

Case	Variables	Pesaran's CD test	Prob.
Iran- EU trade	**LExport**	16.71	0.00
	LImport	19.35	0.00
	LYY	33.69	0.00
	LCTI	36.95	0.00
	LURB	18.52	0.00
	LREM	27.03	0.0
Iran- Asian countries trade	**LExport**	18.68	0.00
	LImport	20.02	0.00
	LYY	39.48	0.00
	LCTI	45.12	0.00
	LURB	23.84	0.00
	LREM	26.15	0.00

Source: Authors' compilation from Eviews 9.0

It should be mentioned that the result of the cross-section dependence test guides us to select a proper panel unit root test. Considering our CD test result that depicts cross-sectional dependence of our series, the most proper unit root test is the cross-sectionally augmented ADF (Pesaran, 2007).

5.2 Panel-Based Unit Root Tests

In order to determine the stationarity of all the underlying time series data in a cross sectional dependent panel, we carry out the CADF panel unit root test (Pesaran, 2007) for the variables at levels and first differences.

Pesaran(2007) for a panel with N cross-sectional units and T time series observations, suggests a simple linear heterogenous model as:

$$Y_{i,t} = (1 - \delta_i)\mu_i + \delta_i Y_{i,t-1} + u_{i,t} \qquad i = 1, \dots, N \quad t = 1, \dots, T \qquad (10)$$

And suggests a test based on the t-ratio in the following cross-sectionally ADF regressions:

$$\Delta Y_{i,t} = a_i + b_i Y_{i,t-1} + c_i \overline{Y}_{t-1} + d_i \Delta \overline{Y}_t + \epsilon_{i,t} \qquad (11)$$

In the above equation, $\bar{Y}_t = \frac{1}{N}\sum_{i=1}^{N} Y_{i,t}$ and $\Delta\bar{Y}_t = \frac{1}{N}\sum_{i=1}^{N} \Delta Y_{i,t}$. Furthermore, $\epsilon_{i,t}$ indicates the regression error.

By applying this unit root test through the software, the results are calculated as:

Table 5: Panel unit root test results

Case	Variable	Pesaran's CADF	H0	Stationary
Iran- EU trade	LExport	20.08 [0.62]	Accept	No
	D(LExport)	259.00[0.00]	Reject	Yes
	LImport	18.53-0.88]	Accept	No
	D(LImport)	320.63[0.00]	Reject	Yes
	LYY	24.12[0.59]	Accept	No
	D(LYY)	201.52[0.00]	Reject	Yes
	LCTI	25.43[0.71]	Accept	No
	D(LCTI)	285.09[0.00]	Reject	Yes
	LURB	23.74[0.79]	Accept	No
	D(LURB)	327.58[0.00]	Reject	Yes
	LREM	18.32[0.66]	Accept	No
	D(LREM)	185.17[0.00]	Reject	Yes
Iran- Asian countries trade	LExport	26.80 [0.61]	Accept	No
	D(LExport)	198.08[0.00]	Reject	Yes
	LImport	19.69[0.85]	Accept	No
	D(LImport)	201.64[0.00]	Reject	Yes
	LYY	18.11[0.88]	Accept	No
	D(LYY)	271.01[0.00]	Reject	Yes
	LCTI	20.73[0.75]	Accept	No
	D(LCTI)	198.53[0.00]	Reject	Yes
	LURB	28.04[0.51]	Accept	No
	D(LURB)	221.18[0.00]	Reject	Yes
	LREM	19.48[0.66]	Accept	No
	D(LREM)	201.83[0.00]	Reject	Yes

Note: Numbers in brackets represent p-values
Source: Authors' compilation from Eviews 9.0

The reported p-values in the above table imply that all the series are non-stationary at levels (means accepting the null hypothesis representing that the series contain a panel unit root) and stationary (rejecting the null hypothesis) at their first difference which stands for the integration at I(1).

5.3 Long-run relationships

Considering the results of the panel-based unit root test, the Pedroni panel cointegration test can be applied to find out whether there is any long-run equilibrium relationship between the series (Nasre Esfahani and Rasoulinezhad (2016), Taghizadeh Hesary et al. (2015), Saboori et al. (2017) and Taghizadeh Hesary et al. (2017)). The results are reported in Table 6. From the results, by considering all the panel, group and weighted statistics, it indicates that the most statistics have p-value less than 0.05 and hence, the majority of the all statistics tests can significantly reject the H_0 of no cointegration at the 5% significance level. In sum, it can be concluded that there is an evidence of a long run relationship between variables in all our four models.

Table 6: Pedroni Panel Cointegration Test results

Case	Model		Statistic	Prob.	Weighted statistic	Prob.
Iran- EU trade	Model I (Export-based gravity model)	Panel v-statistic	-0.13	0.55	-3.34	0.99
		Panel rho-statistic	3.97	1.00	-2.45*	0.00
		Panel PP-statistic	-0.49	0.30	-3.97*	0.00
		Panel ADF-statistic	-4.49*	0.00	-4.27*	0.00
		Group rho-statistic	5.46	1.00	-	-
		Group PP-statistic	-3.81*	0.00	-	-
		Group ADF-statistic	-4.47*	0.00	-	-
	Model II (Import-based gravity model)	Panel v-statistic	1.53**	0.06	0.79	0.21
		Panel rho-statistic	-4.36*	0.00	-2.81*	0.00
		Panel PP-statistic	-5.81*	0.00	-4.74*	0.00
		Panel ADF-statistic	-5.13*	0.00	-4.55*	0.00
		Group rho-statistic	-2.20*	0.01	-	-

		Group PP-statistic	-5.56*	0.00	-	-
		Group ADF-statistic	-5.31*	0.00	-	-
Iran- Asian countries trade	Model I (Export-based gravity model)	Panel v-statistic	2.05*	0.02	-0.78	0.78
		Panel rho-statistic	-1.73*	0.04	-0.34	0.36
		Panel PP-statistic	-6.76	0.00	-4.20*	0.00
		Panel ADF-statistic	-7.38*	0.00	-4.81*	0.00
		Group rho-statistic	0.69	0.75	-	-
		Group PP-statistic	-6.23*	0.00	-	-
		Group ADF-statistic	-5.98*	0.00	-	-
	Model II (Import-based gravity model)	Panel v-statistic	1.05	0.14	0.51	0.30
		Panel rho-statistic	-2.89*	0.00	-2.02	0.02
		Panel PP-statistic	-4.36*	0.00	-3.97*	0.00
		Panel ADF-statistic	-3.94*	0.00	-4.27*	0.00
		Group rho-statistic	-1.64*	0.05	-	-
		Group PP-statistic	-4.49*	0.00	-	-
		Group ADF-statistic	-4.91*	0.00	-	-

Note: (*) indicates statistical significance at the 5% level.
Source: Authors' compilation from Eviews 9.0

5.4 Panel-Gravity trade Model Estimation

Considering the existence of a long-run relationship between series in all
our gravity equations, the three panel data estimation approaches, i.e.
fixed effect (FE), random effect (RF) and fully modified OLS (FMOLS)
are applied to explore the coefficients of our all variables. Since there is
not a common view to the efficiency of estimation methods of panel co-
integration (e.g. see, Pedroni (1996, 2001) recommends the fully

modified OLS (FMOLS) estimator. Cheng and Wall (2005) and Anderson and Wincoop (2003) suggest the fixed effects (FE) or Soren et al. (2014) propose the random effects (RE))we apply all the three panel estimators (FE,RF and FMOLS) to estimate the coefficients. It should be mentioned that the coefficients for the time-invariant variables can not estimated by the FE estimator. The findings are reported in Table 7.

Table 7: The Panel-Gravity trade model estimations

-	-	Variables	FE	RF	FMOLS
Iran- EU trade	Model I (Export-based gravity model)	LYY	0.35(0.00)	0.24 (0.01)	0.35 (0.00)
		LCTI	0.39(0.00)	0.41 (0.00)	0.43 (0.02)
		LURB	0.10 (0.02)	0.18 (0.01)	0.13 (0.00)
		LREM	0.31 (0.00)	0.29 (0.00)	0.26 (0.00)
		LDIS	-	-0.49 (0.00)	-
		SANC	-0.50 (0.00)	-0.41 (0.00)	-0.53 (0.00)
		WTO	0.66(0.01)	0.56(0.00)	0.61(0.00)
	Model II Import-based gravity model)	LYY	0.38 (0.00)	0.27 (0.02)	0.35 (0.00)
		LCTI	0.24 (0.00)	0.21 (0.00)	0.29 (0.00)
		LURB	0.20 (0.01)	0.18 (0.00)	0.24 (0.00)
		LREM	0.24 (0.00)	0.19 (0.00)	0.26 (0.03)
		LDIS	-	-0.64 (0.00)	-
		SANC	-0.63 (0.00)	-0.58 (0.00)	-0.63 (0.03)
		WTO	0.78(0.00)	0.67(0.00)	0.71(0.01)
Iran- Asian countries trade	Model I (Export-based gravity model)	LYY	0.98 (0.00)	0.83 (0.00)	0.28 (0.03)
		LCTI	0.41(0.01)	0.35 (0.00)	0.48 (0.00)
		LURB	0.49 (0.00)	0.43 (0.00)	0.36 (0.00)
		LREM	0.31 (0.01)	0.28 (0.00)	0.37 (0.00)
		LDIS	-	-1.46 (0.01)	-
		SANC	0.56(0.00)	0.55 (0.00)	0.61 (0.01)
		WTO	0.51(0.02)	0.53(0.00)	0.51(0.00)
	Model II Import-based gravity model)	LYY	0.72 (0.00)	0.85 (0.00)	0.81 (0.00)
		LCTI	0.55(0.00)	0.49 (0.00)	0.59 (0.01)
		LURB	0.38 (0.00)	0.46 (0.01)	0.50 (0.00)
		LREM	0.44 (0.0)	0.40 (0.01)	0.47 (0.00)
		LDIS	-	-1.49 (0.00)	-
		SANC	0.63 (0.03)	0.66 (0.01)	0.73 (0.00)
		WTO	0.64(0.00)	0.68(0.00)	0.60(0.00)

Source: Authors' compilation from Eviews 9.0

Iran-EU trade pattern:

In the case of the Iran-EU trade pattern, it is clear that the basic features of three panel-cointegration gravity model estimations are very similar. The estimation results of the export-based gravity model of Iran-EU

trade confirm that GDP, trade openness (the composite trade index), urbanization growth, WTO and MTR have a significant positive impact on export of Iran to the EU, while geographical distance negatively influences on the export volume. Moreover, as we predicted, sanctions against Iran decrease the export volume of this country to the EU member states. This result proves the Trade Divergence (TD) or Iran's trade policy of de-Europeanization under sanctions. The estimation findings of "Model II" for the import pattern of Iran from the 25 EU member states depict that economic size, trade openness (the composite trade index), urbanization growth, WTO and MTR accelerate the import volume growth of Iran from the 25 EU member states, while similar to the first model estimation result, geographical distance and sanctions have a significant negative impact on the import volume. Again, this result in the case of import of Iran from the EU supports the Trade Divergence (TD) or Iran's trade policy of de-Europeanization under sanctions.

Iran-Asia trade pattern:

In the case of Iran's bilateral trade with the 25 Asian countries, the results in the case of export volume of Iran to the 25 Asian countries reveal that a 1% increase in the joint GDP in Iran and the 25 Asian countries, raises the export volume by approximately 0.70%. Trade openness and urbanization growth have a less positive influence on the Iran-Asian countries' export volume. The results show that the export flows from Iran to these 25 Asian countries are boosted up about 0.41% and 0/42% with a 1% increase in the CTI and urbanization growth, respectively. Moreover, the effect of the sanctions (SANC) on Iran's export volume to the Asian countries is positive and significant which supports the existence of the Trade Convergence (TC) or Iran's trade policy of Asianization under sanctions. Besides, accession to the WTO and MTR have a positive effect on Iranian export pattern to the Asian nations. In the case of Model II (Import-based gravity trade model), the coefficients' signs are similar to the previous gravity model (Export-based gravity trade model). A 1% increase in the joint GDP, CTI, urbanization growth and REM raises the import volume of Iran from the 25 Asian countries by approximately 0.79%, 0.54%, 0.44% and 0.43%, respectively.

Further discussion on time-invariant variables' coefficients:

The findings of models estimations provide evidence of a significant negative effect of sanctions on Iran –EU member states' bilateral trade (both in export-based and import-based gravity trade model). The coefficient of SANC is estimated at an average of 43% [=Exp(-0.56)-1] by FE estimator, compared to an average of 39 % [=Exp(-0.49)-1] by FE and 44% [=Exp(-0.58)-1] by FMOLS. This indicates that trade volume decreases by nearly 42%[1] when the sanctions are imposed against Iran.

In regards to the positive effect of sanctions on Iran-Asian countries' bilateral trade, it can be calculated that the trade volume increases about 82.2% [=Exp(0.60)-1] by FE, 82.2% [=Exp(0.60)-1] by RE and 95.4% [=Exp(0.67)-1] by FMOLS. As an average of findings by these three estimators, trade volume between Iran and the 25 Asian countries would increase by 86.6%[2]

In the case of distance as a proxy of transportation cost, the negative sign of its coefficient, estimated by random effect (RE), represents that geographical distance has a negative impact on export and import volumes between Iran and the EU member states and Asian countries. A 1% increase in this variable decreases the exports and imports volumes between Iran and the 25 EU member states by nearly 0.49% and 0.58%, respectively, while by 1% increase in geographical distance leads to a reduction of export and import volumes between Iran and 25 Asian countries by about 1.46% and 1.49%, respectively.

The estimations results of WTO prove the positive role of the accession to this organization in accelerating trade flow growth between nations. In the case of Iran-EU bilateral trade pattern, the coefficients revealed an increase of export and import volumes between Iran and the 25 EU trading partners by about 84% [=Exp[(0.61)-1] and 105.4% [=Exp(0.72)-1], respectively. Considering the estimation results in the case of Iran-Asia bilateral trade, it can be said that export and import volumes increase by approximately 66.5% [=Exp(0.51)-1] and 89.6% [=Exp(0.64)-1], respectively, when an Asian trading partner of Iran is a member of the World Trade Organization (WTO).

1- It is calculated as the average of 43%, 39% and 44%
2 It is calculated as the average of 82.2%, 82.2% and 95.4%

6. Concluding remarks

This study was an empirical attempt to investigate whether the imposition of sanctions against Iran pushed this country toward the Trade Convergence with Asia (Asianization) and the Trade Divergence to Europe (de-Europeanization). To this end, we analyzed the impacts of GDP, CTI as a proxy for trade openness, urbanization growth, the MTR, distance, WTO and sanctions on Iran – EU member states and - Asian countries bilateral trade in a gravity theory of international trade from 2006 to 2015. To acheiveing better results, we considered gravity model for exports and imports, separately.

Our estimation results are in line with the opinion of Fidrmuc (2009) about similarity of estimators' results for panel co-integration. Our results reveal that the basic features of gravity model estimations are very similar across all three estimators, i.e. FE, RE and FMOLS.

Considering the results from the analysis of the gravity models, we can conclude that:

- In regards to Iran's export to the EU, the results revealed the positive influence of economic size, trade openness, urbanization growth, the MTR and accession to the WTO, while the estimations showed that imposing sanctions against Iran decreased the exports volume of this sanctioned country to the EU by nearly 38.1%.

- In the case of Iran's import from the EU, the estimations results proved the positive impact of economic size, trade openness, urbanization growth, the MTR and accession to the WTO, while the results expressed that imposition of economic sanctions against Iran reduced Iran's import from the EU by approximately 45.8%.

- A comparison of the export-based and import-based gravity models of trade between Iran and the EU indicates that the negative effect of economic sanctions on the import volume of Iran is larger than the impact on export volume of this country to the EU.

- The estimation results for the Iran's export pattern to the Asian countries supported the positive relationship between economic size, trade openness, urbanization growth, the MTR and WTO with the Iran's export volume to the Asian countries, while the results showed the negative impacts of sanctions and geographical distance on the Iran's export flows to the Asian nations.

- In regarding to the Iran's import pattern to the 25 Asian nations, the coefficient signs are similar to the case of previous export-based gravity model. While GDP, trade openness, urbanization growth, the MTR and WTO positively affected the Iran's import volume from the Asian nations, the imposition sanctions against Iran and geographical distance deaccelerated the Iran's import volume from the 25 Asian countries.

- A comparison of the import-based and export-based gravity models of Iran-Asia trade flows proved that the positive effects of sanctions on Iran's import from the Asian countries (nearly 92.3%) are larger than the positive effects of this variable on the export volume of this country from the Asian nations (about 77.4%).

- The imposition of sanctions in related to the Iran's nuclear program pushed the foreign trade policy of this country towards the Trade convergence to Aisa (Asianization) and away from Europeanization (the Iran's Trade divergence from the EU).

Following the empirical results and conclusions, we can recommend that the imposition of sanctions against a country generally can not have a harsh effect on its trade flows. Because the target country can find new markets with new trade opportunities. It means that the target country can reshape its trade pattern from the sanctioning nations toward the non-sanctioning countries. This fact can create the Trade divergence and Trade convergence of the target country under sanctions. We can draw the attention of sanctioning countries to this issue that sanctions can not be an efficient policy in the long-run. Hence, it can be recommended that these nations have to find a substitution for the policy of imposition economic sanctions. Moreover, sanctioned country can rapidly reshape

their trade patterns and try to catch up to non-sanctioning countries and go to reach to the divergence from sanctioned nations.

To sum up the paper, it can be expressed that since there are a vast number of other factors such as geopolitical concerns, trade risks , tariffs and pricing, visa procedures and transports which were not considered in our models,the author suggests future researches with a larger data about these factors giving a better result and fewer errors.

Reference

Aalto, P., and Forsberg, T. (2016). "The structuration of Russia' geo-economy under economic sanctions". *Asia Europe Journal*. 14(2), 221-237.

Anderson, J.E., and Wincoop, E.V. (2003). "Gravity with gravitas: A solution to the border puzzle". *The American Economic Review*, 93(1), 170-192.

Baier, S.L., and Bergstrand, J.H. (2007). "Do free trade agreements actually increase members' international trade?" *Journal of International Economics*, 71(1), 72-95.

Baldwin,R., and Taglioni, D. (2011). "Gravity chains: estimating bilateral trade flows when parts and components trade is important". *European Central Bank working paper*, No.1401. URL: https://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp1401.pdf?f31f47e880 48bf6df7a78e5e887f4f65 (accessed in 18.06.2017)

Barrett, S. (1997). "The strategy of trade sanctions in international environmental agreements". *Resource and Energy Economics*, 19 (4), 345-361.

Breusch, T.S., and Pagan, A.R. (1980). "The lagrange multiplier test and its applications to model specification in Econometrics". *Review of Econometric Studies*, 47, 239-253.

Caruso, R. (2003). "The impact of international economic sanctions on trade: An empirical analysis". *Peace Economics, Peace Science and Public Policy*. 9(2), http://ideas.repec.org/p/wpa/wuwpit/0306001.html

Central Bank of Iran (2015). Iran's Economic Time Series Database. URL: http://tsd.cbi.ir/ [Accessed on 15 June 2015]

CEPII, (2015). GeoDist database. URL: http://www.cepii.fr/en/bdd_ modele/presentation.asp?id=6. [Accessed on 15 June 2015]

Cheng, I.H., and Wall, H.J. (2005). "Controlling for heterogeneity in gravity models of trade and integration", *Federal Reserve Bank of St.Louis*, 87(1). URL: https://research.stlouisfed.org/publications /review/2005/01/01/controlling-for-heterogeneity-in-gravity-models-of-trade-and-integration/ [accessed on 18 June 2017]

Dollery, B.E. (1993). "A conceptual note on financial an trade sanctions against South Africa". *Economic Analysis and Policy*. 23(2), 179-188.

Elmorsy, S.S. (2015). "Determinants of trade intensity of Egypt with COMESA countries". *Journal of Global South*, 2(5), 1-25.

Esmaeili, A., and Pourebrahim, F. (2011). "Assessing trade potential in agricultural sector of Iran: application of gravity model". *Journal of Food Products Marketing*, 17(5), 459-469.

Fahimifard, S.M. (2013). "Studying Iranian economic integration with OIC members using gravity model". *Journal of Money and Economy*. 8 (1), 169-181.

Fidrmuc, J. (2009). "Gravity models in integrated panels". *Emprirical Economics*. 37, 435-446.

Gharehgozli, O. (2017). "An estimation of the economic cost of recent sanctions on Iran using the synthetic control method". *Economics Letter* (In press). doi: https://doi.org/10.1016/j.econlet.2017.06.008

Haidar, J.I. (2016). "Sanctions and export deflation: evidence from Iran. The de Nederlandsche Bank: Amsterdam", *The Netherlands*. URL: http://www.economic-policy.org/wp-content/uploads/2016/04/sanctions-and-export-deflation-evidence-from-Iran.pdf (accessed on 18 June 2017)

Hufbauer, G.C., Elliont, K.A., Cyrus, T., Winston, E. (1997). US economic sanctions: their impact on trade, jobs and wages. Peterson Institute for International Economics: Washington DC., USA.

IMF. (2015). The world economic ourtlook database. URL: http://www.imf.org/en/data [accessed on 16 June 2017]

IRICA. (2015). URL: http:// www.irica.gov.ir [Accessed on 16 June 2017]

Jabalameli, F., and Rasoulinezhad, E. (2012). "Iran solutions against the economic sanctions: analytic hierarchy process approach". *American Journal of Business and Management*. 1 (1), 23-29.

Kalbasi, H. (2002). "The gravity model and Iran's trade flows". *Asian Economic Review*. 44(2), 225-243.

Katoozian, H. (1993). Masaddegh and struggle for Iranian authority. Tehran: Markaz Publications: Iran.

Lamotte, O., (2012). "Disentangling the impact of wars and sanctions on international trade: Evidence from former Yugoslavia". *Comparative Economic Studies*. 54(3), 553-579.

Lanchovichina, E., Devarajan, Sh., and Lakatos, C. (2016). "Lifting economic sanctions on Iran: global effects and strategic responses". *World Bank Policy Research Working Paper*, No.7549. Washington DC. USA. URL: http://documents.worldbank.org/curated/en/docsearch/document-type/620265

Nasre Esfahani, M., and Rasoulinezhad, E. (2016). "Will be there new CO2 emitters in the future? Evidence of long-run panel co-integration for N-11 countries". *International Journal of Energy Economics and Policy*. 6 (3), 463-470.

Pedroni, P. (1996). Fully modified OLS for heterogeneous cointegrated panels and the case of purchasing power parity. Indiana: USA.

Pedroni, P. (2001). "Purchasing power parity tests in cointegrated panels". *Review Economics Statistics*. 83, 727-731.

Pesaran, M.H. (2007). "A simple panel unit root test in the presence of cross-section dependence". *Journal of Applied Econometrics*, 22(2), 265-312.

Popova, L., and Rasoulinezhad, E. (2016). "Have sanctions modified Iran's trade policy? An evidence of Asianization and de-Europeanization". *Economies,* 4 (4), 24.

Scott, J.J. (2012). "Economic sancitons against Iran: is the third decade a charm?". *Business Economics*. 47 (3), 190-192.

Mehchy, Z., Nasser,R. and Schiffbauer, M. (2015). "Trade determinants and potential in Syria: Using a gravity model". *Middle East Development Journal*. 7, 226-251.

Rasoulinezhad, E. (2016). "Investigation of sanctions and oil price effects on the Iran-Russia trade by using the gravity model". *Vestnik of St.Petersburg university*, Series 5. 2, 68-84.

Rasoulinezhad, E. (2017). "China's foreign trade policy with OPEC member countries". *Journal of Chinese Economic and Foreign Trade Studies*. 10 (1), 61-81.

Rasoulinezad, E., and Kang, GS. (2016). "A panel data analysis of South Korea's trade with OPEC member countries: the gravity model approach". *Iranian Economic Review*. 20 (2), 203-224.

Saboori, B., Rasoulinezhad, E., and Sung, J. (2017). "The nexus of oil consumption, CO2 emissions and economic growth in China, Japan and South Korea". *Environmental Science and Pollution Research*. 24 (8), 7436-7455.

Setayesh, S., and Mackey, T.K. (2016). "Addressing the impact of economic sanctions on Iranian drug shortages in the joint comprehensive plan of action: promoting access to medicines and health diplomacy". *Globalization and Health*. 12,31. doi:10.1186/s12992-016-0168-6

Shirazi, H., Azerbaiejani, K., and Sameti, M. (2016). "The effect of economic sanction on Iran's export". *Iranian Economic Review*. 20 (1), 111-124.

Soori, A.R., and Tashkini, A. (2012). "Gravity models: an application to trade between Iran and regional blocs". *Iranian Economic Review*. 16 (31), 1-12.

Soren, P., Behnhard, B., and Glauben, T. (2014). "Gravity model estimation: fixed effects vs. random intercept poisson pseudo maximum likelihood", 148, URL: https://www.econstor.eu/bitstream/10419 /97149/1/786371315.pdf

Squalli, J., and Wilson, K. (2006). "A new approach to measuring trade openness". Dubai, UAE. URL: http://www.zu.ac.ae/ research /images/06-07-web.pdf.

Suvankulov, F., and Guc, Y. (2012). "Who is trading well in Central Aisa? A gravity analysis of exports from the regional powers to the region". *Eurasian Journal of Business and Economics*. 5 (9), 21-43.

Taghavi, M., and Hosein Tash, N. (2011). "Testing the gravity mdoel in Iran and some oil-exporting countries". *Economic Research Review*. 11 (3), 187-212.

Taghizadeh Hesary, F., Rasoulinezhad, E., and Kobayashi, Y. (2015). "Oil price fluctuations and oil consuming sectors: an empirical analysis of Japan". *ADBI Working Paper. No. 539*. URL: http://www.adb.org /sites/default/files/publication/166896/adbi-wp539.pdf

Taghizadeh Hesary, F., Yoshino, N., and Rasoulinezhad, E. (2017). "Impact of the Fukushima Nuclear Disaster on the oil-consuming sectors of Japan". *Journal of Comparative Asian Development*. 15 (3), 1-22

Tian,H., and Whalley,J. (2010). "Trade sanctions, financial transfers and BRIC participation in global climate change negotiations". *Journal of Polocy Modeling*.32(1), 47-63.

Tinbergen, J. (1962). Shaping the World Economy: suggestions for an international economic policy. New York: The Twentieth Century Fund.

Torbat, A.E. (2005). "Impacts of the US trade and financial sanctions on Iran". *The World Economy*. 28 (3), 407-434.

Van Bergeijk, P.A.G. (1992). "Diplomatic barriers to trade". *De Economist*. 140(1), 45-64.

Venkuviene, V., and Masteikiene, R. (2015). "The impact of Russian Federation economic embargo on the Central and Eastern countries business environment". *Procedia Economics and Finance*, 26, 1095-1101.

Wooldridge, J.M. (2013). Introductory Econometrics: a modern approach.Cengage Learning Publication, 5th Edition. USA.

World Bank, (2015). World Development Indicators. URL: http:// data.worldbank.org [accessed on 17 July 2017]

Yang, J., Askari, H., Forrer, J., and Teegen, h. (2009). "How do US economic sanctions affect EU's trade with target countries". *The World Economy*.32 (8), 1223-1244.