The Impact of Environmental Quality on Intra-Industrial Trade between Iran and Selected Business Partners

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Abstract

Problems of sustainable development and environmental protection pose a challenge to humanity unprecedented in scope and complexity. Whether and how the problems are resolved have significant implications for human and ecological well-being.

Climate change affects not only the domestic activities of any country, but also its foreign activities, including foreign trade. One of the threats to the foreign trade sector is climate change and greenhouse gases. The consequences of rising greenhouse gas emissions and the resulting climate change are the most serious international environmental concerns. International institutions have sought to overcome this concern by directing production and trade around the world.

In today's world, no country can live separately from other countries and inevitably needs exchanges. Topics such as intra-industry trade are among the new topics that have been widely discussed in international trade in recent decades and have become very important as the world enters the field of globalization. On the other hand, most countries in the world are focused on protecting the environment and reducing pollution.

The purpose of this article is to investigate the effects of environmental quality on the intra-industry trade between two selected groups of agricultural and related industries and selected industrial and factory goods between Iran and selected trading partners including (France, Japan, South Korea, Italy, Spain, Belgium, Russia , Australia, Germany, Denmark, China, Turkey, UAE and Pakistan) by using gravity model during the period of 2001-2018. The econometric pattern was estimated using the least squares method generalized in the panel data environment.

The results show by increasing the average emissions between Iran and its trading partner, the flow of intra-industry trade with Iran's trading partner increase in selected agricultural goods and related industries. In addition, the average variable coefficient of emission of pollution in all equations related to intra-industry trade in industrial goods and factories is not significant.

Keywords: Intra-Industry Trade, Environmental Quality, Gravity Model.
JEL Classification**:** F14, F18

1-Introduction

The consequences of climate change can disrupt trade. The physical effects of climate change will have direct and indirect consequences for business. Direct impacts include the impacts of climate change on supply, transportation and distribution chains related to trade. Indirect effects caused by the effect of climate change on the production of goods and services are obtained through changes in the factors of production, i.e. land, labor and capital. The direct and indirect effects of climate change on trade can lead to changes in the relative advantage of economies and trade flows and patterns.

Climate change affects business through multiple channels, not all of which are easily measurable. One of the prominent explanations for international trade in the past decades was the reduction of international transportation costs. One of the fundamental impacts of climate change is that supply, transportation and distribution chains will become more vulnerable to disruptions caused by climate change, thereby affecting future international trade patterns. For example, extreme weather events lead to the temporary closure of ports and transportation routes. Climate change may also damage critical business infrastructure. These interruptions can lead to delays, increase the costs of international trade, and lead to changes in trade patterns as companies involved in trade seek options to increase the reliability of transportation (WTO, 2009).

Although the literature on the relationship between climate change and trade is limited and mostly qualitative, there is broad agreement among experts that climate change will have a negative impact on transportation infrastructure. According to the reports reviewed by the IPCC, climate change affects all types of transportation related to international trade, including sea transportation, land transportation, and aviation.

Climate change can manifest itself in the destruction of road and bridge infrastructure and shorter access to transportation routes through the de-icing of polar regions. In addition, higher temperatures accelerate the melting of ice and destroy asphalt roads (IPCC[1], 2014). Also, the air transportation of goods is affected by climate change by damaging the operations of airports. In addition, maritime transport, which constitutes about 80% of world trade in terms of volume and more than 70% of world trade in terms of value, can experience negative consequences due to climate change (The United Nations Conference on Trade and Development, 2014). Increased storm surges, increased rainfall, and rising sea levels cause frequent port closures, affect shipping speeds, and necessitate the use of alternative or safe shipping routes. Transportation cost is an important factor to determine the business model and in turn transportation cost is determined by variables such as distance, time, trade volume and ship size, competition, infrastructure and other risks (OECD, 2011). Among the factors affecting transportation costs, distance is considered as one of the most important determining factors, so that as the distance between two countries increases, the volume of trade decreases and it reflects the cost of transportation, the increase in the cost of transporting goods, and the increase in the length of transit.

Climate change directly affects labor, capital, land and natural resources.

In the report on the economic consequences of climate change (OECD, 2015), some of the economic and macro consequences of climate change in the absence of appropriate climate policies are predicted as follows:

Changes in crop yields, loss of land and capital due to sea level rise, changes in catches and fisheries, capital losses due to hurricanes, changes in labor productivity and changes in health care costs due to diseases and heat stress, changes in tourism flows, and Energy demand for cooling and heating.

Some sectors are directly affected by specific climate effects: Like service sectors affected by health effects, energy sectors affected by energy demand. However, there are also significant indirect effects resulting from a wide range of price changes that follow climate impacts. For example, changes in energy demand affect energy prices and cause changes in the production of industrial sectors. Also, the destruction of capital caused by sea level rise affects all sectors through changes in the final productivity of capital.

Thus, the adverse effects of climate change affect the production of all goods in the economy, including goods that can be traded internationally. For example, agricultural products are affected by climate change due to the increase in temperature. In addition, changes in rainfall in most regions lead to a significant decrease in crop yield and thus to a decrease in crop production. Changes in GDP generally correspond to overall changes in the volume of trade at the macro level. Countries whose national income is affected by climate impacts not only reduce domestic economic activity but also trade volume, so that their production costs increase much more than the costs of their business partners, and as a result, their macroeconomic competition decreases.

International trade statistics show the fact that a major part of trade between countries is trade in similar goods and services, i.e. intra-industry trade. Until the 1960s, trade between countries was explained by

[1] Intergovernmental Panel on Climate Change

conventional theories of international trade and based on structural differences, such as differences in technology and the abundance of production factors of countries, and based on basic assumptions that are somewhat far from reality. After that, empirical observations (Fung and Maechler, 2007) proved the fact that these theories only consider inter-industry trade, that is, the trade of different products belonging to different industries. A major share of the trade that is related to the simultaneous trade of goods belonging to a specific industry remains unexplained. For this reason, the theories of trade within the industry were expanded based on the assumptions of increasing efficiency to scale and imperfect competition.

Discussions such as intra-industry trade are among the new issues that have been raised in international trade in recent decades and that too on a wide scale, and at the same time as the world enters the field of globalization, it has gained great importance. On the other hand, the attention of most countries of the world is focused on the issue of environmental protection and reducing pollution.

2- Theoretical Foundation

A number of prominent economists such as Bhagwati (1988) and Subramanian (1992) believe that free trade issues should be considered together with environmental issues,Otherwise, the domestic production support system can easily overshadow the global trade system based on the changed environmental results. Based on this issue, governments interested in improving the environment will accept environmental policies more easily than commercial policies (Dean ,1992).

Any action to further liberalize trade should be based on weighing the costs of maintaining barriers against the benefits of reducing environmental damage. The environmental results obtained from microeconomic analyzes in the field of trade show that if free trade policies are designed in the direction of environmental policies, it will reduce the negative environmental effects caused by the growth of consumption and production. In microeconomic production models, the production of each product includes the combination of production inputs such as labor, capital, land and technology, but the quality of the environment is not considered in the production function and pollution as a variable dependent on the production stages. For example, a manufacturing company is considered which, by producing product x, causes the release of greenhouse gases in the environment, which results in the creation of acid rain, which causes damage to buildings and trees. Also, other households and businesses around the pollution site will be affected, and potentially in other countries, it will cause the transfer of acid rain across borders. Since firms bear only the private costs resulting from the use of production inputs to produce good x, there is a gap between private costs and social costs. A logical solution to this problem would be to define a specific policy from the government to reduce the production output of commodity x through production restrictions or by creating incentives to reduce the company's output.(Tulkens and Schoumaker,1975)

Delink et al. (2017) in their analytical report titled "Results of International Trade Due to Climate Change" examine how damages caused by climate change will affect international trade in the coming decades and how international trade can reduce the costs of climate change. The effects of climate change on trade are analyzed by considering direct effects on infrastructure and transportation routes and indirect economic effects resulting from changes in production factors. Qualitative analysis is used with literature review to provide direct effects. The indirect impacts of climate change damages on trade are analyzed using the ENV- Linkages model, a dynamically computable general equilibrium model with global coverage and sector-specific international trade flows.

The report highlights important regional differences in the impacts of climate change on regional and sectoral economic activity and competitiveness. Consequently, international trade changes are controlled not only by domestic climate effects, but also by the relative intensity of these effects compared to major trading partners. By being aware of how climate impacts the economy, not only through the impact on factors of production but also on trade, countries can adjust appropriate climate and trade policies and thus avoid minimal weather-related damage.

Chen and Cherniwchan (2017) have presented a simple general equilibrium model in an article titled "Intra-Industry Trade and Environment". It includes firm increasing returns, differentiated products, monopolistic competition and endogenous environmental policy to examine the effects of intra-industry trade between two identical countries on local emissions. First, it is assumed that companies consider emission production as a common product of every production activity, and the level of greenhouse gas emissions is determined endogenously in response to the company's product reduction decisions. Second, consumers are assumed to be averse to domestic emissions in addition to having the same preferences for a variety of goods. Third, there is a government that regulates pollution in its economy using a quota implemented through a marketing permit system. They use this framework to examine the impact of intra-industry trade between two identical countries on pollution and welfare.

The findings of this study show that the effect of free trade on environmental quality may depend on how the benefits of import diversification affect consumers' willingness to pay environmental costs. Also, free trade between identical countries can improve welfare, even if trade increases emissions. The results also highlight a new impetus for linking environmental agreements and free trade. Thus, when markets are monopolistically competitive, free trade leads to less global pollution because the costs of domestic environmental policy are not borne entirely by domestic consumers. Similarly, free trade may be accompanied by an agreement to coordinate environmental policy among countries to maximize global welfare.

Younespour and Tayibi (2019) in an article titled intra-industrial trade of Iran and selected trading partners with an environmental approach to examine the size and type of mutual trade between Iran and selected neighboring trade partners, East Asia and some members of the European Union and identify the relationship Its environment is based on the measurement of important indicators of Grobel-Lloyd, Fontan and Fredenberg and Azhar and Elliott index in the period (2001-2015). Based on the obtained results, a significant share of trade within the mutual industry of Iran and selected countries is dedicated to trade within the vertical industry, which shows that the competitive pressure on Iranian goods is small and according to the Azhar and Elliott index, the major share of the trade within the industry consists of low quality goods.

Roy (2017) first addresses the trade and environment debate by providing an empirical study of the environmental implications of intra-industry trade. Then it uses the GMM approach to optimize the data of 8 environmental quality factors for 200 countries during the period of 2000-2005. The results show that intra-industry trade improves the quality of the environment. Also, compared to general trade, intra-industry trade has a significant effect on improving the quality of the environment due to lower adjustment costs and easier absorption of technology.

Levy and Dinopoulos (2016) introduce global environmental standards with heterogeneous pollutants through an intra-industry trade model with heterogeneous pollutants and structurally symmetric countries. They analyze the effects of global environmental standards along with three trade liberalization policies in a formula. They show that when consumers' preferences for environmental quality are weak, firms find that polluting production is more profitable, and they are eager to export it. As a result, the effects of stricter environmental standards on global pollution and improving the quality of the environment are significant.

Samimi and Gholami (2014), in an article entitled the effect of economic globalization on environmental sustainability: comparison of developing and developed countries, the effect of economic globalization on the environmental sustainability of two groups of developing countries and developed countries in the time period of 2005-2011 and using the method Tabular data have been evaluated. They believe that in general, it is still unclear whether economic globalization has a positive or negative effect on environmental sustainability. In this article, according to the Kuznets environmental curve hypothesis and the pollution shelter hypothesis, it is assumed that the globalization of the economy in developing countries leads to a decrease in environmental sustainability, and in developed countries it ends up improving environmental sustainability. Then, using the maximum available information, the effect of economic globalization on environmental sustainability in 9 developing countries and 20 developed countries and using the panel data method and introducing a virtual variable and using the new KOF economic globalization index has been investigated. The results of the estimation show that the effect of globalization on environmental sustainability is negative and significant in both groups of developing and developed countries, and the difference in the impact of economic globalization on environmental sustainability is not significant between these two groups of countries.

Erdogan (2014) develops an environmental trade model based on the new trade theory and emphasizing the role of international efficiency differences on the quality of the environmental outcomes of trade. In this article, environmental policy and natural endowment differences are introduced using the multi-country general equilibrium model of international trade along with stochastic productivity and trade barriers for OECD countries. The calibration model is used to analyze the effects of free trade and two types of environmental harmonization policies. He concludes that complete trade liberalization leads to a 32% reduction in pollution emissions in OECD countries, and about half of this pollution reduction is through international differences in productivity. Also, the results show that the optimization of environmental taxes has been effective in reducing pollution in these countries.

Tayyibi and Younespour (2012) assess the impact of trade openness on Iran's environmental quality in the country's trade relations with selected countries in East Asia, the Middle East, and the OECD during the period 1991-2007. This study first deals with the theoretical discussion and then develops a theoretical framework to explain the relationship between the environment and trade, which shows a clear analysis of the impact of trade on the level of pollution. The framework presented by Antweiler et al. (2001), based on the Heckscher Ohlin trade model, decomposes the environmental impact of interindustry trade into scale, combination, and technical effects. Finally, empirical equations are used to analyze the relationship between bilateral trade and environmental quality. Experimental results show the positive effect of increasing GPD on the pollution of countries in the first and second blocks. In addition, empirical results have shown that Iran cannot benefit from its trade income with OECD countries and the Middle East. Also, the results show that increasing the ratio of capital to labor increases the production of greenhouse gases. As high-income countries have more stringent standards, this in turn suggests that the pollution consequences of capital accumulation diminish as development progresses.

In investigating the effect of intra-industry trade on the quality of the environment in Iran's trade relations with selected countries in three different areas, Tayibi et al. The investigation of this issue emphasizes the effects of scale, selection and technique during the years 1991 to 2007. In this study, it is tried to be conducted on the basis of theoretical and experimental studies and in the form of an econometric model, the relationship between the quality of the environment and the increase of intra-industry trade is investigated. The estimation results in this time period indicate the positive impact of GDP on pollution only in the second commercial area. Also, their results have shown that Iran has not been able to use its trade relations and the competition created under intra-industry trade to improve the quality of the environment. In addition, an increase in the capital-labor ratio leads to an increase in greenhouse gas production, so that high-income countries have stricter environmental standards, which in turn suggests that the pollution consequences of capital accumulation decrease with increased development.

Azarbaijani and Taati (2013) in a study entitled "Characteristics of intra-industry vertical trade in Iran: a panel data approach", analyzed the characteristics of intra-industry vertical trade using Grable and Lloyd index between Iran and some of its important trading partners (China, South Korea, UAE United Arab Emirates, Japan, Turkey, Malaysia and Singapore) during the period (1997-2006) using panel data approach. In this study, Iran's intra-industry trade with its seven important trading partners for the period (1997-2006) has been measured and its vertical and horizontal components have been analyzed.

The calculated levels of total IIT show that in addition to the importance of IIT in trade between developing countries, the share of IIT in Iran's trade with its major trading partners is at a low level. This shows that foreign trade is still important for Iran's trade with selected countries. Another noteworthy point regarding the findings of this research is that the vertical IIT has a high importance in Iran's business with a share of 80.92 percent in the total IIT. This high share of vertical IIT shows that Iran's intra-industry trade basically includes two-way exchange of goods and services that are qualitatively different. Therefore, an increase in the share of horizontal IIT, which is equivalent to a decrease in vertical IIT, will be of interest to Iran, because this approach indicates an increase in the quality of Iran's exports. he empirical results of this article reveal the existence of a positive relationship between the level of vertical IIT and the levels of GDP and differences in GDP per capita between Iran and selected countries. In other findings, when the geographical distance between countries increases, the level of vertical IIT increases, which is not compatible with the existing theoretical expectations, which can be caused by the structure of the transportation network. Although the literature on the relationship between climate change and trade is limited and mostly qualitative, there is considerable agreement among experts, that climate change will have a negative impact on transportation infrastructure and, as a result, international trade. On the other hand, following the presentation of business models within the industry, many empirical studies have been conducted for developed countries, but the scope of these studies is small for developing countries.

While it is necessary to examine this issue in order to identify the competitive power of these countries and increase their export power in the global arena. Also, paying attention to economic convergence through removing bilateral trade barriers of goods and services, creating trade zones, customs unions and other preferential trade arrangements has led to the use of common economic policies among member countries, and in this way, the share of intra-industry trade and the total trade between them will increase.

Therefore, in this study, the effects of environmental quality on the flow of intra-industry trade of two groups of selected agricultural goods and related industries and the group of selected industrial and factory goods between Iran and selected trading partners have been investigated, which includes the countries (France, Japan, South Korea, Italy, Spain, Belgium, Russia, Australia, Germany, Denmark, China, Turkey, United Arab Emirates and Pakistan) in the form of estimation of commercial attraction model during 2018-2001.

3- Research methods

3- 1- research methodology

In addition to paying attention to industry characteristics, theoretical models of intra-industry trade pay attention to some country characteristics that determine intra-industry trade. As an example, we can mention the level of growth and development, difference in per capita income (Linder's variable), market size, difference in market size, geographical proximity, trade integration and trade barriers (transportation cost), which in the studies of Balassa (1986), Helpman (1987) and Bergstrand (1990) have been used. The specific determining factors of the industry include: economies of scale, product differentiation, market structure, multinational companies, research and development expenses, which will be examined further on the role of each of these factors:

The level of growth and development: the higher the level of growth and development of the countries, the higher the potential power of intra-industry trade, because developed countries have the ability to produce diverse products. Product variety leads to potential demand for differentiated products. The most important variable for measuring this factor is the variable of GDP per capita of the two countries.

Difference in per capita income of two countries (Linder's variable): Based on this factor, similar countries tend to trade with each other more than dissimilar countries. In addition, this variable shows the difference in the inventory of production factors of the two countries from the supply side, and from the demand side, the difference in the structure and preferences of the consumers of the two countries. According to the Helpman and Krugman (1981) models, the difference in the inventory of production factors (capital and labor) of two countries leads to a decrease in intra-industry trade and an increase in inter-industry trade. Also, based on Linder's hypothesis, countries with a similar income structure will have a similar demand structure, and if two countries have the same income (demand) pattern, the products that can be imported and exported by the two countries will be the same but different .Therefore intra-industry trade will increase. In general, based on the theoretical foundations of intra-industry trade, the relationship between Linder's variable and intra-industry trade will be negative.

Market size: Larger countries have a higher ability to produce products with increasing efficiency compared to scale and are able to produce more differentiated products. Lancaster (1980) shows that there is a direct relationship between the average market size of two countries and their intra-industry trade. Various criteria have been introduced to measure this variable, such as gross national product, gross domestic product, and population. Also, some researches have used the total or average gross domestic product of two countries.

Difference in market size: The difference in the market size of two countries indicates the difference in the degree of economies of scale of production and therefore the difference in the ability to produce distinctive products by the two countries. If the market size of two countries is the same, due to economies of scale of production, each country will specialize in only a subset of distinct products. In other words, similar levels of market size will indicate the same ability to produce similar products and higher intra-industry trade. If the countries are the same in all aspects, including market size, intra-industry trade will certainly take place between them. Therefore, as much as the difference in the market size of two countries decreases, intra-industry trade between them increases. In addition, how the income of two countries is distributed is not unaffected by the difference in the market size of those two countries on intra-industry trade. So that the more equal and similar the distribution of income in the two trading partner countries is, the greater the impact of the mentioned variable on intra-industry trade. Various criteria have been introduced to measure this factor, among which the Balasa index can be mentioned. Helpman (1987) used another relative measure to measure the difference in the market size of two countries, which is:

$$INEQ' = \ln\left[1 - \left(\frac{GDP^j}{GDP^j + GDP^k}\right)^2 - \left(\frac{GDP^k}{GDP^j + GDP^k}\right)^2\right] \qquad (1)$$

This index is in the range of ∞ and 0.69 and with the increase of relative inequality, the size of the market decreases.

Geographical proximity: Geographical proximity includes three determinants of intra-industry trade. The first factor is the cost of transportation, in which the closer the countries are to each other, the lower the cost of transporting goods and the more similar their cultures and tastes are, and as a result, intra-industry trade increases in them. The neighborhood of countries is checked through the virtual variable of proximity. This variable is given a virtual weight if the countries have a common border or the distance between them is less than a certain limit.

Trade integration: This factor is measured through the dummy variable of membership in the same financial or customs unions. By joining economic unions, countries reduce trade barriers and exchange costs. Also, commercial integrations indicate the cultural similarity of countries, which strengthens the possibility of intra-industry trade. In general, it can be said that participation in economic convergence projects increases intra-industry trade between members due to the reduction of trade barriers between members and probably due to the geographical proximity of member countries.

Trade barriers: Trade barriers include natural barriers and trade policies (Kelark, 1993). Transportation costs are considered as a natural barrier and tariff and non-tariff barriers are considered as barriers caused by commercial policies. In intra-industry trade theories, transportation cost has a negative effect on intra-industry trade. But it should be noted that the progress in the international marketing transportation system has reduced the cost of transportation and the time required to transport products. And it has made it possible to have quick and easy access to the products in demand at any time and place. In addition, due to economic trade groupings such as the European Union (EU), ASEAN (ASEAN) and NAFTA (NAFTA). And the joining of the majority of the world's countries to the World Trade Organization has greatly reduced the importance of tariff and non-tariff barriers in intra-industry trade (Raisi, 1383). One of the explained criteria to examine the impact of trade barriers is the trade concentration variable, which was proposed by Balassa (1986) in the world of business.

Economies of production scale: This factor shows the reduction of costs in an industry by increasing the size of the production company. If the economies of scale are high, but this factor is small compared to the size of the market, it causes each country to specialize in only a subset of distinct products. And this topic, along with the diversity of consumers' tastes, motivates intra-industry trade in the country.

Product life cycle: The more time that has passed in the life of the product, the greater the potential of producing a variety of products, and as a result, the potential of trade within the industry will be higher. Creating diversity in the product is a time-consuming matter, but by doing this, the possibility of trade within the vertical industry increases due to the higher quality of the product, as its life increases (Stone and Lee, 1995).

Multinational companies: the more the factors of production of two countries are similar, the IIT increases. On the other hand, whatever the factors of production are similar, foreign direct investment will decrease. Therefore, multinational companies with FDI in the opposite country, in a way, replace IIT. From another point of view, today advanced industrial countries export different parts of a complex product in different production countries, in a final assembly country and to other countries (Havrey and Kunze, 1997).

Other factors: Among other factors affecting intra-industry trade, we can mention the common language and border, which can have a positive effect on intra-industry trade. Anyway, such variables are secondary variables and what is important in the formation of intra-industry trade is the economic structure of the countries.

Trade imbalance: this variable is used in experimental studies such as Stone and Lee (1995) and is not considered as a determining factor. Rather, as the trade imbalance increases, the IIT index decreases. To control any distortion in the estimation of the determining factors of intra-industry trade, it is considered and calculated by the following relationship:

$$IMB = | Xij - Mij | / (Xij + Mij) \quad (2)$$

Xij, Mij: Export and import of industrial products of country i to (from) country j.

Exchange rate variable: This variable is calculated as the ratio of the exchange rate of country j to country i, each of which is based on the real exchange rate according to the US dollar and fixed prices. This ratio shows the exchange rate of two countries, so that one unit of currency of country j is equal to several units of currency of country i. The expected sign of this variable is negative, because in the mutual IIT relationship, each country plays both the role of exporter and importer. An increase in the exchange rate causes a decrease in the import of j from i and an increase in their export, and finally reduces the IIT (Chidok and Zinvanomojo , 2009).

3- 2- Specification of the experimental model

The discussion of bilateral business relations between two business partners is an issue that is included in the gravity model. The structure of this model was presented in the 60s and 70s. The gravity model is one of the important tools in the empirical research of international trade, which provides the possibility of estimating bilateral trade flows at a specific point in time and simultaneously from the point of view of the exporting and importing countries (H.Gary, 1979). These models state that the volume of bilateral trade has a direct relationship with the economic scale or GDPs of the two trading partners and an inverse relationship with the distance between the two partners. The structure of this model is properly presented in the studies of Kelaasen (1972) and Kelaasen and vanwickeren (1969). Based on this, the greater the economic size of two regions or the smaller their geographical distance, the greater the amount of trade flows, human resources (migration) and information exchanges between these two regions. Since the gravity model has high flexibility, other variables are also added to the model (Taibi, 2003). The phenomenon of intra-industry trade can be divided in the form of one of the types of bilateral trade relations between two countries, which is the subject discussed in the gravity model. That is, the attraction model is a tool or a model to examine the relationship between this type of bilateral trade according to its determining factors.

In the simplest case, the trade attraction model traditionally involves two forces of attraction and repulsion in the estimation of trade between countries. In such a way that the income of business partners plays the role of attraction force and their increase leads to the increase of the level of trade between the respective countries, and the geographical distance between the two countries has led to a decrease in trade between them and therefore plays the role of repulsion. Therefore, the standard and traditional gravity model is defined as follows:

$$T_{ij} = f\ (GDP_i, GDP_j, DIS_{ij}) \quad (3)$$

Where T_{ij} is the bilateral trade flow including the total of exports and imports between two countries i and j, GDP_i and GDP_j are the gross domestic products of countries i and j and DIS_{ij} is the geographical distance between two countries i and j.

Also, due to the fact that the size of the countries has a significant effect on the production of differentiated products with the characteristic of increasing efficiency compared to the scale (trade within the industry), the population variable is introduced as a measure to measure this variable.

According to the theoretical foundations of the determinants of intra-industry trade, including the studies of Balassa (1986), Helpman (1987) and Bergstrand (1990) as well as IIT models, specific country characteristics determining intra-industry trade between Iran and selected trading partners have been considered that including the gross national product of Iran (GDP_i), the gross national product of the selected trading partner (GDP_j), the population of Iran (POPi), the population of the selected trading partner (POPj), the geographical distance between the two countries of Iran and the selected trading partner (DISTANCEij) and whether Trade balance (IMB) is considered.

On the other hand, based on some studies of bilateral trade and environmental relations, this h as led to the inclusion of environmental results in trade agreements, such as the General Agreement on Tariffs and Trade (GATT) and the North American Free Trade Agreement (NAFTA) (Ghiadopa and Chater, 2000). As a result, in order to investigate the effect of environmental quality on intra-industry trade, an index of environmental quality (ENQ) is included as an independent variable in the intra-industry trade model:

$$IIT = F\,(GDP_i, GDP_j, POP_i, POP_j, IMB, DISTANCE, ENQ) \qquad (4)$$

The prescribed form of the intra-industry trade model of Iran and selected trade partner countries is in the form of a linear equation as follows:

$$IIT_{ijt} = \alpha_0 + \alpha_1 LGDP_{jt} + \alpha_2 LGDP_{it} + \alpha_3 LPOP_{it} + \alpha_4 LPOP_{jt} + \alpha_5 |IMB_{ijt}| + \alpha_6 LDIS_{ijt} + \alpha_7 LaENQ_{kij} + U_{ijt} \qquad (5)$$

In order to measure the amount of intra-industry trade, the index of Grobel and Lloyd (1975) is used, which is currently considered one of the most important indices of intra-industry trade. For this purpose, the selected commodity groups were separated into two groups of agricultural goods, related industries and industrial goods, and the Grobel-Lloyd index between Iran and the relevant trading partner was calculated for each commodity code. i Indicates Iran and j indicates the selected business partner.

After that, the average indicators obtained for each product group have been used as a variable of intra-industry trade between Iran and selected trading partners separately in relation to the air pollutants related to each sector in the above equation. The air emissions used in the group of agricultural goods and related industries include emissions of carbon dioxide, methane in the agricultural sector, nitrogen oxide in the agricultural sector and fine dust (PM2.5) and air emissions. In the group of industrial and factory goods, it includes carbon dioxide emissions from factory industries, methane, nitrogen oxide in the energy sector and general greenhouse emissions.

3-3-Iran's business relations with business partners

In 2017, Iran's top export destinations include China ($16.9 billion), South Korea ($7.22 billion), Italy ($3.48 billion), and Japan ($3.23 billion), and the main source of imports is China (18.4 billion dollars), South Korea (4.02 billion dollars), Germany (3.22 billion dollars) and Turkey (3.15 billion dollars). Also, in 2017, the European Union exported more than 10.8 billion euros of goods to Iran and imported more than 10.1 billion euros of goods from Iran. According to published statistics, Germany is known as the largest European exporter to Iran in 2014, and Italy and France are ranked second and third in this respect. Germany exported 2.39 billion euros, Italy 1.156 billion euros and France 452 million euros of goods to Iran. Italy was the largest European importer of goods from Iran in 2014, and Germany and Spain ranked second and third respectively. Italy's imports from Iran in 2014 amounted to 440 million euros, Germany's 280 million euros and Spain's 113 million euros.

Australia's bilateral relations with Iran include a long-term trade relationship. The value of Australia's bilateral trade in goods and services with Iran was 572 million dollars in the fiscal year 2017-2018. Traditionally, Iran has been one of the important destinations for wheat exports in Australia, and other primary exports include wool and meat[2].

According to the above content and also considering that Iran's trading partners in exports during the years 2011 to 2018 were China, Iraq, UAE, Afghanistan, South Korea, Turkey, India and Pakistan and in imports China, UAE, India, Turkey and Germany respectively. In this study, the countries of China, Japan, Korea, UAE, Turkey, Pakistan, Russia, Italy, Spain, France, Germany, Belgium, Australia, and Denmark) have been considered as selected trade partners of Iran. So that the stability and continuity in maintaining business relations with developed countries among the country's business partners, the approach of preserving and improving the quality of the environment in this type of business model (trade within the industry) has been strategic.

[2] https://dfat.gov.au/geo/iran/Pages/iran-country-brief.aspx

3-4- Business data sources

The data related to the export and import of selected goods in Iran's trade relations with selected trade partners have been collected from the databases of the Trade Development Organization of Iran (Trade Map) [3] and (UNDP)[4] in the period (2001-2018). The variables of GDP, population, geographical distance, trade imbalance and air pollutants are taken from the World Bank (WDI)[5] website.

The statistical population under evaluation is the selected developed and developing business partners of Iran. Countries that have the largest share in Iran's foreign trade during the study period are selected as Iran's main partners. That is, they have the largest ratio of total bilateral exports and imports between Iran and the country of the trading partner to the total exports and imports of the whole of Iran.

4 -The results of estimating the model of the effect of environmental quality on Iran's intra-industry trade with selected countries:

4-1- intra-industry trade of agricultural goods and related industries

The specified pattern of intra-industry trade is estimated by the generalized least squares method in the panel data environment. How environmental quality affects the intra-industry trade flow of selected agricultural goods and related industries between Iran and selected trading partners including countries (France, Japan, South Korea, Italy, Spain, Belgium, Russia, Australia, Germany, Denmark, China, Turkey, United Arab Emirates and Pakistan) to be analyzed. For this purpose, based on the gravity model, the following model is used:

$$IIT(Agriculture)_{ijt} = \alpha_0 + \alpha_1\, LGDP_{jt} + \alpha_2\, LGDP_{it} + \alpha_3\, LPOP_{it} + \alpha_4\, LPOP_{jt} + \alpha_5\, |IMB_{ijt}| + \alpha_6\, LDIS_{ijt} + \alpha_7\, LaENQ_{kij} + U_{ijt} \quad (6)$$

Where IIT(Agriculture)ijt is the average intra-industry trade of selected agricultural goods and related industries based on the Grobel-Lloyd index in Iran's bilateral trade relations (i) with selected trading partners (j). (LGDP it) the logarithm of Iran's gross domestic product, ($LGDP_{it}$) Logarithm of GDP of Iran's trading partner, ($LPOP_{it}$) و ($LPOP_{it}$) respectively, the logarithm of the population of Iran and the logarithm of the population of Iran's trading partner. $|IMB_{ijt}|$ Absolute value of trade imbalance, ($LDIS_{ijt}$) The logarithm of the geographical distance between the two countries of Iran and its trading partner at time t, ($LaENQ_{kij}$). The logarithm of the average related emissions in the agricultural sector, including emissions of carbon dioxide, methane in the agricultural sector, nitrogen oxide in the agricultural sector, and fine dust (PM2.5) between the two countries of Iran and its trading partner at time t, which is considered as an indicator of environmental quality . Based on table (1) and Kao's co-accumulation test, checking the values of the calculated statistics and the probability of their acceptance, it shows that the residuals are at the zero level, and as a result, the variables are co-accumulated at the zero level, and the said regression is not false.

Table (1): The results of the KAO cointegration test of the model of the effect of environmental quality on the intra-industry trade of selected agricultural products and related industries of Iran with selected countries

Pollution index	Carbon dioxide emission model in the agricultural sector	Model of the methane sector in the agricultural sector	Nitrogen oxide emission model in the agricultural sector	Fine dust emission model
statistics	-2/360455	-2/635782	-2/550878	-3/333574
Possibility	0/0091	0/0042	0/0054	0/0004

Based on Table 2, Limer's F statistic is used to choose between panel data and pooling methods. This test is a comparison between sum of squares of error sentences (RSS) in panel data method and

[3] https://www.trademap.org
[4] www. Undp.org
[5] http://publications.worldbank.org/wdi

consolidated data. Based on this test, considering that in all estimations, the F statistic was large and its probability was smaller than 0.05, it can be concluded that the estimation method is the panel data method.

Table 2: Choice between panel data and pooled data methods in selected agricultural commodities and allied industries

Pollution index	carbon dioxide	Methane in the agricultural sector	Nitrous oxide in the agricultural sector	fine dust
F Leamer statistics	9/55	7/25	6/86	2/50
P-value	0/0000	0/0000	0/0000	0/0052

In the second step, the Hausman test was used to distinguish between the fixed effects model and the random effects model. Hausman's test shows that all equations are random effects models. Also, in the third stage, in order to choose the random effects method and the ordinary least squares method, the Broush Pegan multiplication coefficient test was used, and the equation related to the emission of methane pollution in the agricultural sector is the ordinary least squares method. In other cases, the random effects model is selected and based on the results of the LR test to achieve more accurate results (random effects model), the model will be estimated using the generalized least squares (GLS) method.

Table (3): The results of variance heteroscedasticity test to estimate the attractiveness pattern of intra-industry trade of selected agricultural products and related industries of Iran and selected partners

Pollution index	carbon dioxide	Methane in the agricultural sector	Nitrous oxide in the agricultural sector	fine dust
chi	31/83	31/83	38/43	44/98
P-value	0/0025	0/0025	0/0002	0/0000

Table (4): Estimation of intra-industry trade attractiveness pattern of selected agricultural goods and related industries

Iran and selected partners: the effect of carbon dioxide emissions

Variables	Constant	L GDP_j	L GDP_i	L POP_i	L POP_j	$\lvert IMB_{ij}\rvert$	LDIS_{ij}	La CO2$_{ij}$
Coefficients GLS	2/981877	0/064409	0/0303132	-0/3989283	0/0711436	-0/0402466	-0/2235861	0/1720615
Statistics Z	0/93	3/14	0/61	-0/93	4/75	-1/76	-8/23	3/25
P >$\lvert Z\rvert$	0/354	0/002	0/541	0/351	0/000	0/078	0/000	0/001
Cognitive tests	Wald Chi2(7)= Prob>Chi2=0/00 Log likelihood=236/0429 Hausman Fe Chi2(6)=1/94 Prob >Chi=0/9248 Xttest0 Chibar=2(01)=26/69 Prob>Chibar=0/000							

Table (5): Estimation of intra-industry trade attractiveness pattern of selected agricultural goods and related industries

Iran and selected partners: the effect of methane emissions in the agricultural sector

Variables	Constant	L GDP_j	L GDP_i	L POP_i	L POP_j	$\lvert IMB_{ij}\rvert$	LDIS_{ij}	La Agricultural Methane ij
Coefficients OLS	0/1910376	0/1045915	-0/044578	0/0008166	-0/0075592	-0/0667195	-0/2824883	0/1658254
Statistics t	0/01	4/05	-0/29	0/00	-0/33	-2/10	-7/07	3/85
P >$\lvert t\rvert$	0/991	0/000	0/774	1/000	0/741	0/038	0/000	0/000

Cognitive tests	F(7, 104)=11/53 Prob >F=0/00 R-Squared=0/4369 A dj R-Squared=0/3991 Hausman Fe Chi2(6)=10/41 Prob >Chi2=0/1084 Xttest0 Chibar2(01)=1/93 Prob>Chibar2=0/0822

Table (6): Estimation of intra-industry trade attractiveness pattern of selected agricultural goods and related industries
Iran and selected partners: the effect of nitrogen oxide emissions in the agricultural sector

Variables	Constant	L GDP_j	L GDP_i	L POP_i	L POP_j	$\|IMB_{ij}\|$	$LDIS_{ij}$	La Agricultural Nitrous Oxide ij
Coefficients GLS	-1/234309	0/0700495	-0/0421059	0/2074742	0/0039496	-0/0762308	-0/2474244	0/1079994
Statistics Z	-0/08	3/04	-0/27	0/10	0/18	-2/43	-6/59	2/94
$P > \|Z\|$	0/939	0/002	0/784	0/922	0/860	0/015	0/000	0/003
Cognitive tests	Wald Chi2(7)=75/54 Prob >Chi2=0/00 Log likelihood=129/4126 Hausman Fe Chi2(6)=7/09 Prob >Chi=0/3124 Xttest0 Chibar2(01)=6/62 Prob>Chibar=0/0051							

Table (7): Estimation of intra-industry trade attractiveness pattern of selected agricultural goods and related industries
Iran and selected partners: the effect of the release of fine dust (PM2.5)

Variables	Constant	L GDP_j	L GDP_i	L POP_i	L POP_j	$\|IMB_{ij}\|$	$LDIS_{ij}$	La lapm2.5 ij
Coefficients GLS	-1/371619	0/1786813	0/0477599	-0/1638374	0/0586151	0/0433266	-0/0746856	0/9493446
Statistics Z	-0/45	6/31	0/74	-0/43	3/08	1/56	-1/78	4/59
$P > \|Z\|$	0/657	0/000	0/461	0/666	0/002	0/120	0/074	0/000
Cognitive tests	Wald Chi2(7)=62/79 Prob >Chi2=0/00 Log likelihood=147/6061 Hausman Fe Chi2(6)=1/86 Prob >Chi=0/9318 Xttest0 Chibar2(01)=5/08 Prob>Chibar=0/0121							

The results obtained from the estimation show that in all cases the variable coefficient of the trading partner's gross domestic product (LGDPj) is positive and significant. he positive coefficient (LGDPj) shows that as the economic size of Iran's trading partner country increases, it will cause an increase in the volume of trade within their industry. he variable coefficient of Iran's gross domestic product (LGDPi) is not significant in any of the models.

The population variable coefficient is not significant for Iran, but it is positive and significant for Iran in the model related to carbon dioxide and fine dust emissions. As mentioned before, these symptoms can be interpreted. Larger countries have a higher ability to produce products with increasing efficiency compared to scale and are able to produce more differentiated products. In the sense that the population of each trading partner country increases, the volume of intra-industry trade also increases.

Based on the obtained results, the distance variable in all models except for the model related to the diffusion of fine dust, whose coefficient is not significant. It is negative, expected and significant at the 5% significance level, which indicates the decreasing effect of this variable on the amount of intra-industry trade.

The variable coefficient of the absolute value of the trade imbalance in the methane and nitrogen oxide emission model in the agricultural sector is negative and significant, and it is not significant in other models

The added variable in the model to determine the effect of each variable affecting the intra-industry trade of selected agricultural goods and related industries is the average number of publications in countries i and j as an indicator of environmental quality and calculating its impact on the intra-industry trade of agricultural goods and related industries.

In all cases, the coefficients of emissions are positive and significant, which shows that if the average emissions between the two countries of Iran and its trading partner increases, the trade flow within Iran's industry with the trading partner in selected agricultural products and related industries will increase.

4-2- intra-industry trade of industrial and factory goods

In this part, the specified pattern of intra-industry trade is estimated by the generalized least squares method in the panel data environment, how environmental quality affects the intra-industry trade flow of selected industrial and factory goods between Iran and selected trading partners including (France, Japan, South Korea, Italy, Spain, Belgium, Russia, Australia, Germany, Denmark, China, Turkey, United Arab Emirates Arabic and Pakistan) to be analyzed.

For this purpose, based on the gravity model, the following model is used:

$$IIT(Industry)_{ijt} = \alpha_0 + \alpha_1\, LGDP_{jt} + \alpha_2\, LGDP_{it} + \alpha_3\, LPOP_{it} + \alpha_4\, LPOP_{jt} + \alpha_5\, |IMB_{ijt}| + \alpha_6\, LDIS_{ijt} + \alpha_7\, LaENQ_{kij} + U_{ijt} \quad (11)$$

where IIT(Industry)ijt is the average intra-industry trade of selected industrial and factory goods based on the Grobel-Lloyd index in Iran's bilateral trade relations (i) with selected trading partners (j). ($LGDP_{it}$)The logarithm of the gross domestic product of Iran and ($LGDP_{jt}$) the logarithm of the gross domestic product of Iran's trading partner. ($LPOP_{it}$), ($LPOP_{jt}$) respectively, the logarithm of the population of Iran and the logarithm of the population of Iran's trading partner. $|IMB_{ijt}|$ The absolute value of the trade imbalance ($LDIS_{ijt}$) is the logarithm of the geographical distance between the two countries of Iran and its trading partner at time t. ($LaENQ_{kij}$) The logarithm of the average emission of related pollution of industrial and factory goods includes emissions of carbon dioxide from factory industries, methane, nitrogen oxide in the energy sector and overall greenhouse emissions between the two countries of Iran and the selected trading partner at time t, which is considered as an indicator of environmental quality.

Based on table (8) and the Kao co-accumulation test, the examination of the calculated statistical values and the probability of their acceptance shows that the residuals are at the zero level, and as a result, the variables are co-accumulated at the zero level, and the said regression is not false.

Table (8): The results of the Kao cointegration test of the model of the effect of environmental quality on the intra-industry trade of selected industrial and factory goods of Iran with selected countries

Pollution index	Carbon dioxide from factory industries	methane	Nitrous oxide in the energy sector	General greenhouse publications
Statistics t	-3/819569	-3/411649	-2/976064	-2/294456
Possibility	0/0001	0/0003	0/0015	0/0109

Based on table (9), Limer's F statistic is used to choose between panel data and pooling data methods. Based on this test, considering that in all estimations the F statistic was large and its probability was smaller than 0.05, it can be concluded that the estimation method is the panel data method.

Table (9): Choice between tabular data methods and consolidated data in selected industrial and factory goods.

Pollution index	Carbon dioxide from factory industries	methane	Nitrous oxide in the energy sector	General greenhouse publications
Limer's F Statistics	24/36	23/000	12/29	10/21
P-Value	0/000	0/000	0/0000	0/000

The results obtained from the Hausman test and the Brosh -Pagan coefficient test show that the equations related to the emission of carbon dioxide, methane and nitrogen oxide emissions in the energy sector are the random effects model and the equation related to the overall greenhouse emissions are the fixed effects method. In the following, based on the results of the heterogeneity of variance test and in order to achieve more accurate results (in the fixed effects model and the random effects model), the model will be estimated using the generalized least squares (GLS) method.

Table (10): The results of variance heterogeneity test for the estimation of intra-industry trade attractiveness model in selected industrial and factory goods

Pollution index	Carbon dioxide from factory industries	methane	Nitrous oxide in the energy sector	General greenhouse publications
Chi2(13)	110/96	102/65	100/13	97/12
P-Value	0/000	0/000	0/0000	0/000

Table (11): Estimation of the attractiveness pattern of intra-industry trade of selected industrial and factory goods of Iran and selected partners: the effect of carbon dioxide emissions caused by factory industries

Variables	Constant	L GDP_j	L GDP_i	L POP_i	L POP_j	$\lvert IMB_{ij} \rvert$	$LDIS_{ij}$	La lapm2.5 ij
Coefficients GLS	3/275422	0/0769073	0/0241747	-0/4220307	0/04036	-0/0051296	-0/1820265	0/0331668
Statistics Z	1/10	6/67	0/62	-1/07	4/25	-0/35	-8/93	0/70
P >$\lvert Z \rvert$	0/272	0/000	0/534	0/286	0/000	0/728	0/000	0/484
Cognitive tests	Wald Chi2(7)=143/96 Prob >Chi2=0/00 Log likelihood=316/5005 Hausman Fe Chi2(6)=8/91 Prob >Chi=0/1784 Xttest0 Chibar2(01)=211.28 Prob>Chibar=0/000							

Table (12): Estimation of intra-industry trade attraction pattern of selected industrial and factory goods of Iran and selected partners: effect of methane emission

Variables	Constant	L GDP_j	L GDP_i	L POP_i	L POP_j	$\lvert IMB_{ij} \rvert$	$LDIS_{ij}$	La Methane ij
Coefficients GLS	6/388544	0/0736707	0/061324	-0/8275416	0/0447736	-0/0040941	-0/1857151	-0/006043
Statistics Z	0/91	5/79	0/80	-0/89	4/08	-0/27	-10/20	-0/30
P >$\lvert Z \rvert$	0/364	0/000	0/422	0/374	0/000	0/790	0/000	0/764
Cognitive tests	Wald Chi2(7)=125/35 Prob >Chi2=0/00 Log likelihood=274/9754 Hausman Fe Chi2(6)=7/75 Prob >Chi=0/2574 Xttest0 Chibar2(01)=119/39 Prob>Chibar=0/000							

Table (13): Estimation of the attractiveness pattern of intra-industry trade of selected industrial and factory goods of Iran and selected partners: the effect of nitrogen oxide emissions in the energy sector

Variables	Constant	L GDP_j	L GDP_i	L POP_i	L POP_j	$\lvert IMB_{ij} \rvert$	LDIS_{ij}	La Nitrous Oxide Emissions in Energys ij
Coefficients GLS	14/26799	0/0662751	0/1310139	-1/868066	00414082	-0/0098207	-0/1767641	0/0092347
Statistics Z	1/40	4/53	1/35	-1/39	1/70	-0/46	-7/52	0/21
P >$\lvert Z \rvert$	0/163	0/000	0/178	0/165	0/088	0/643	0/000	0/832
Cognitive tests	Wald Chi2(7)=74/01 Prob >Chi2=0/00 Log likelihood=180/5996 Hausman Fe Chi2(6)=9/86 Prob >Chi=0/1306 Xttest0 Chibar2(01)=31/39 Prob>Chibar=0/000							

Table (14): Estimation of intra-industry trade attractiveness pattern of selected industrial and factory goods of Iran and selected partners: the effect of general greenhouse publications

Variables	Constant	L GDP_j	L GDP_i	L POP_i	L POP_j	$\lvert IMB_{ij} \rvert$	LDIS_{ij}	La Nitrous Oxide Emissions in Energys ij
Coefficients GLS	13/21264	0/0602423	0/1113671	-1/739512	0/0237718	-0/0305093	-0/169022	0/0505591
Statistics Z	1/29	4/03	1/17	-1/30	1/28	-1/32	-6/60	1/53
P >$\lvert Z \rvert$	0/196	0/000	0/244	0/195	0/201	0/186	0/000	0/125
Cognitive tests	Wald Chi2(7)=62/39 Prob >Chi2=0/00 Log likelihood=160/2022 Hausman Fe Chi2(6)=17/33 Prob >Chi=0/0082							

The results obtained from the estimation show that in all cases the variable coefficient of Iran's trading partner's gross domestic product (LGDPj) is positive and significant. The positive coefficient of this variable shows that as the economic size of Iran's trading partner country increases, it will cause an increase in the volume of intra-industry trade with that country. The variable coefficient of Iran's gross domestic product (LGDPi) is not significant in all models.

The population variable coefficient is not significant for Iran, but it is positive and significant for Iran in the model related to the emission of carbon dioxide pollution in industrial industries and methane. In the sense that the population of any country that is Iran's trading partner increases, the volume of intra-industry trade between Iran and the selected trading partner increases.

Based on the obtained results, the distance variable in all models is negative, as expected and significant at the 5% significance level, which indicates the decreasing effect of this variable on the amount of intra-industry trade. The coefficient of variables of absolute value of trade imbalance and the average logarithm of environmental pollution emission are not significant in all models.

The added variable in the model to determine the effect of each of the variables affecting the intra-industry trade of industrial and factory goods, the average emission of various types of related environmental pollution including carbon dioxide emissions from industrial industries, methane, nitrogen oxide in the energy sector and general greenhouse emissions between the two countries of Iran and is the chosen trading partner at time t, which is considered as an indicator of environmental quality, and the coefficient of this variable is not significant in any of the models. Also, the trade imbalance variable is not significant.

5- Conclusion

Climate change not only affects the internal activities of any country, but also affects the overseas activities including the foreign trade of that country. One of the threats to the foreign trade sector is climate change and greenhouse gases.

On the other hand, international trade statistics show the fact that a major part of trade between countries is trade in similar goods and services, i.e. intra-industry trade. Discussions such as intra-industry trade are among the new issues that have been raised in international trade in recent decades and that too on a wide scale, and at the same time as the world enters the field of globalization, it has gained great importance.

The purpose of this article is to investigate the effects of environmental quality on the intra-industry trade flow of two groups of selected agricultural goods and related industries and the group of selected industrial and factory goods between Iran and selected trading partners including countries (France, Japan, South Korea, Italy, Spain, Belgium, Russia , Australia, Germany, Denmark, China, Turkey, the United Arab Emirates and Pakistan) in the form of estimating the pattern of commercial attraction during the period of 2001-2018. The econometric model was estimated by the generalized least squares method in the panel data environment.

In general and by considering the attraction model in this study for intra-industry trade of two groups of agricultural goods and related industries and industrial and factory goods between Iran and selected trading partners, it can be concluded that in all the estimated models, the variable coefficient is positive and significant. The gross domestic product of Iran's trading partner (LGDPj) shows that as the economic size of Iran's trading partner country increases, due to the use of economies of scale and the increase in the production capacity of similar goods, the volume of intra-industry trade between Iran and its trading partner will increase. Larger countries have a higher ability to produce products with increasing efficiency compared to scale and are able to produce more differentiated products. The positive and significant coefficient of the population variable of the country (selected trading partner) means that with the increase in the population of Iran's trading partner, the volume of intra-industry trade between Iran and the selected trading partner increases.

Based on the obtained results, the distance variable in most cases is negative, as expected, and significant at the 5% significance level, which shows that the amount of intra-industry trade increases as the distance between Iran and the selected trading partner decreases. Also, in all equations related to intra-industry trade of agricultural goods and related industries, the average variable coefficient of pollution emission is positive and significant. In the sense that with the average increase in the emission of environmental pollutants of Iran and the selected trading partner, the intra-industry trade of this group of goods will increase. In all equations related to intra-industry trade of industrial and factory goods, the average variable coefficient of pollution emission is not significant in any of the models.

Therefore, according to the obtained results, the competitive pressure on Iranian goods is small, and the major share of Iran's intra-industry trade is in the production of raw materials and low-quality goods. The policy solution is to choose competitive companies and increase intra-industry trade in high quality distinctive products and specialization in clean and environmentally friendly products.

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