

An Analysis of International Outsourcing in Iran-China Trade Relations

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Abstract

Iran-China relations are deeply rooted in history and have been enhanced recently with bilateral cooperation in the areas of energy, arms sales, trade, political cooperation and cultural ties. The objective of this paper is to analyze the role of international outsourcing in form of trading intermediate products on bilateral trade relations between Iran and China. As an empirical work, we have studied the trade structure of intermediate and final goods between the two countries during the period 1992-2011. Intermediate and final goods traded are classified into three groups: 1) electronic product, 2) automobiles and motorcycles, and 3) apparel and footwear. Observations on such products show that the share of Iran's intermediate trade with China in these three industries to total trade is about 55% on average. We have concluded that trade in intermediate goods between Iran and China has been more volatile than that of final goods.

Keywords: *International Trade, International Outsourcing, Intermediate Goods, Global Value Chain (GVC)*

JEL classification: *F10, F23, O19*

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1. Introduction

According to Jones and Kierzkowski (2000), if the term fragmentation suggests destruction, it is creative destruction in the Schumpeterian tradition. Breaking down the integrated process into separate stages of production opens up new possibilities for exploiting gains from specialization. Although such fragmentation is likely to occur first on a local or national basis, significant cuts in costs of international coordination often allow producers to take advantage of differences in technologies and factor prices among countries in designing more global production networks. The fragmentation and offshoring of production processes has been an important phenomenon for many years (Hummels, Ishii, and Yi 2001), having started in the mid-1980s in East Asia and across the US-Mexico border. Ando and Kimura (2005) and Urata (2001), for example, document the linked rise of foreign direct investment, offshoring, and parts and components trade by Japanese firms in East Asia. In North America, the 1980s saw the widespread emergence of ‘twin plants’ (one on either side of the US-Mexico border) under the Maquiladora programme (Dallas Fed 2002, Feenstra and Hanson 1996). Even so, these supplemental statistics illustrate the overall importance of this activity to some developing countries as over 40 percent of the total manufactures exports of Mexico, Jamaica, Haiti, Dominican Republic and El Salvador involve assembly operations using components manufactured abroad.

Antràs and Helpman (2004) have stated that growth of international specialization has been a dominant feature of the international economy. The World Trade Organization provides an example in its 1998 annual report. In the production of an “American” car, 30 percent of the car’s value originates in Korea, 17.5 percent in Japan, 7.5 percent in Germany, 4 percent in Taiwan and Singapore, 2.5 percent in the United Kingdom, and 1.5 percent in Ireland and Barbados. That is, “only 37 percent of the production value is generated in the United States” (p. 36).

Veeramani (2009) has studied the impact of imported intermediate and capital goods on economic growth. He has explained that endogenous growth models emphasize two important mechanisms through which the participation in international trade can raise the long-term growth rate of countries. First,

trade enables the use of better (Aghion and Howitt 1992) and larger (Romer 1987) variety of intermediate products and capital equipment. Second, trade plays an important role as a transmission channel for knowledge spillovers across countries (e.g., Grossman and Helpman 1991, Coe and Helpman 1995, Coe et al, 1997, Keller 2000, 2004). Countries that use imported intermediate products and capital equipments derive benefits because these products embody foreign knowledge. Spillovers arise in this process of knowledge diffusion to the extent the imported products cost less than its opportunity costs –including R&D costs to develop products. Further, import might facilitate learning about the products (for example, reverse engineering), spurring imitation or innovation of competing products. Adding, trade relationships stimulate personal interaction and other channels of communication leading to cross border learning of production methods, product design, organizational methods, and market conditions.

This paper is structured as follows: Section 2 defines and illustrates the concept of international outsourcing. Section 3 analyzes the role and impacts of international outsourcing and intermediate trade on international trade flows. In section 4, we will describe trends of intermediate and final goods trade in the world. Section 5 will study structure of intermediate and final goods trade between Iran and China in period 1992-2011, finally Section 6 will focus on concluding remarks which meet the main objective of this paper.

2. Concept of International Outsourcing

Feenstra (2004) has stated that international outsourcing refers to geographic separation of activities involved in producing a good (or service) across two or more countries. In research by Zorell (2008), value chains have been sliced up into individual tasks, some of which have been relocated to foreign countries, either in the form of offshore in-house production or as purchases of foreign intermediates at arm's length. Both modes are referred to as offshoring. To Grossman and Helpman (2005), outsourcing means more than just the purchase of raw materials and standardized intermediate goods. It means finding a partner with which a firm can establish a bilateral relationship and having the partner

undertake relationship-specific investments so that it becomes able to produce goods or services that fit the firm's particular needs. Often, but not always, the bilateral relationship is governed by a contract, but even in those cases the legal document does not ensure that the partners should conduct the promised activities with the same care that the firm would use itself if it were to perform the tasks.

Antràs and Helpman (2004) have classified and nominated different kinds of strategy for producing an intermediate good: A firm that chooses to keep the production of an intermediate input within its boundaries can produce it at home or in a foreign country. When it keeps it at home, it engages in standard vertical integration. And when it makes it abroad, it engages in foreign direct investment (FDI) and intra-firm trade. Alternatively, a firm may choose to outsource an input in the home country or in a foreign country. When it buys the input at home, it engages in domestic outsourcing. And when it buys it abroad, it engages in foreign outsourcing, or arm's-length trade.

Sometimes, *Offshoring* and *Offshore Outsourcing* are used for *International Outsourcing*. Feenstra (2004), Feenstra and Taylor (2008), have mentioned that *Production Sharing* is a good name for this concept. The term *Production Sharing* was conducted by management consultant Peter Drucker in *Wall Street Journal*, March, 1977. Hence, a variety of expressions are used for this concept by different economists that Feenstra (2004) has pointed to some of them which can be completed:

1. Outsourcing (Katz and Murphy 1992; Feenstra and Hanson 1996)
2. Delocalization (Leamer 1996)
3. Fragmentation (Jones 2000; Arndt and Kierzkowski 2001; Marjit and Acharyya 2003)
4. Intra-product specialization (Arndt 1998a, 1998b)
5. Intra-mediate trade (Antweiler and Trefler 2002)
6. Vertical specialization (Hummels, Ishi, and Yi 2001)
7. Slicing the value chain (Krugman 1995)
8. International outsourcing (Glass and Saggi 2001; Kohler 2004; Meshcheryakova 2005; Bachmann and Braun 2011; Falk 212)
9. Foreign outsourcing (Antràs and Helpman 2004; Elwell 2005)

10. Production Sharing (Drucker 1977; Feenstra and Taylor 2008)

Thus, international outsourcing can be explained by intermediate goods imports from a foreign country. This is based on definition that Antràs and Helpman (2004) have classified and explained in their paper.

3. International Outsourcing and International Trade

As Sturgeon and Memedovic (2010) have stated in their study, there is a rapidly growing body of research examining the processes of geographic fragmentation, dispersion, and long distance coordination in both goods and services industries. Clearly, the rise of what are often referred to as international outsourcing is an important driver of structural change on many levels. When production becomes increasingly fragmented, or “roundabout” (Young, 1929), the increased demand for specialized intermediate goods and services draw a broader range of establishments, firms, workers, and countries into increasingly complex and dynamic division of labor. For nations that are very deeply integrated and economically interdependent with others, the basic structure of industries, employment, and innovation can be affected.

In theory, each segment, activity, or node in the value chain can contribute a set of highly specialized tasks and inputs to build up of finished products or services (Smith, 1776), with the dividing lines between tasks influenced by points of technological dissimilarity (Richardson, 1972) as well as the codification schemes and standards that ease the exchange of appropriate technical information between specialized tasks (Langlois and Robertson, 1995; Baldwin and Clark, 2000; Sturgeon, 2002; and Principe *et al.*, 2003).

Such factors can influence how the work is divided, not only within a factory or single firm, but also in globe-spanning business networks that link several firms, facilities, offices, carriers, and workshops as a product or service takes shape along a value adding chain of activities. Moreover, the potential for international outsourcing formation is increasing. Advances in information technology, better codification schemes, and improvements in transport and logistics increase the potential for the geographical fragmentation of work.

According to Makusen (2002) the traditional view of internationalization

rests on a clear distinction between *produced* commodities and *primary* factors. According to this view, the principle of international arbitrage operates on goods prices via international exchange of goods, based on a given and well-defined underlying value-added process. In addition, it operates on factor prices-directly via international factor movements, and indirectly via the factor-price effects of trade. However, recent developments appear to challenge this view. Improvements in communication technology as well as reductions of formal and technical barriers to trade gave rise to a new vehicle of internationalization where international arbitrage cuts value-added processes into ever smaller slices produced in different locations (Jones and Kierzkowski, 1990; Harris, 1995). In contrast to traditional trade theory, a certain value-added process then no longer takes place under a uniform set of factor prices, but draws on different factor markets for different fragments. The theoretical challenge is to analyze the driving forces and effects of this *process* of increasing international fragmentation. It is quite obvious that this goes beyond extending trade theory to include trade on *established* markets of existing intermediate goods, and indeed a largely accomplished task.

Growth in exports in the 1990s was mostly in exports of technology and human capital-intensive production. They grew by around 17 percent per year as against 9 percent growth for all exports. In contrast, export growth in the 2000s was much more balanced between sophisticated goods and goods more in line with India's static comparative advantage, natural resources and unskilled labor. In the 2000s, however, services exports with much higher human-capital intensity took off with growth of 18 percent per year. The sources of global trade growth provide no strong reasons for export pessimism. In recent years before the global crisis, high-income country imports have grown faster than GDP, driven by differentiation of goods and outsourcing of some elements of production. Developing country exports, in contrast, have risen faster than global GDP because of continuing economic integration, fragmentation of production, and specialization in globalized production networks (Shephard et al., 2011). Hummels et al, (2001) have shown that growth of trade in intermediate goods is more rapid than trade in final goods.

Despite significant data gaps, recent research strongly suggests that global value chain (GVCs) and international outsourcing have become a central force driving structural change in many economies, and that their rise is likely to have triggered both positive and negative outcomes. On the positive side, Bernard *et al.*, (2006) have shown that in the United States, firms that trade tend to be larger, earn higher profits, spend more on R&D, and pay higher wages than firms that do not. Empirical research has also shown that access to a range of competitively priced foreign intermediate goods has been crucial to achieve higher productivity in both industrialized countries and recent developers such as India and China (Miroudot *et al.*, 2009; Goldberg *et al.*, 2008).

For developing countries, trade, investment, and knowledge flows that strengthen international outsourcing can provide mechanisms for rapid learning, innovation and industrial upgrading (Lall, 2000; Humphrey and Schmitz, 2002). GVCs can provide better access to information, open up new markets, and create opportunities for fast technological learning and skill acquisition. Because GVC-linked transactions and investments typically come with quality control systems and prevailing global business standards that exceed those in developing countries, suppliers and individuals in developing countries can be “pushed” to acquire new competencies and skills through their participation in GVCs. In the most deeply linked developing countries, these business process improvements can sometimes be felt far beyond exporting firms and sectors.

At the same time, local firms in developing countries can achieve greater success in their own markets by combining domestic and foreign intermediate inputs and creating economies of specialization that leverage cross-border complementarities. For example, border-spanning GVC linkages can potentially bring local firms into closer contact with “open innovation” systems (Tece *et al.*, 1997 cited in Ketels and Memedovic, 2008), where firms draw on and contribute to freely available technologies and standards. Local firms can also take advantage of specialized knowledge garnered through participation in GVCs to export or set up production abroad, either directly or through contractors and suppliers.

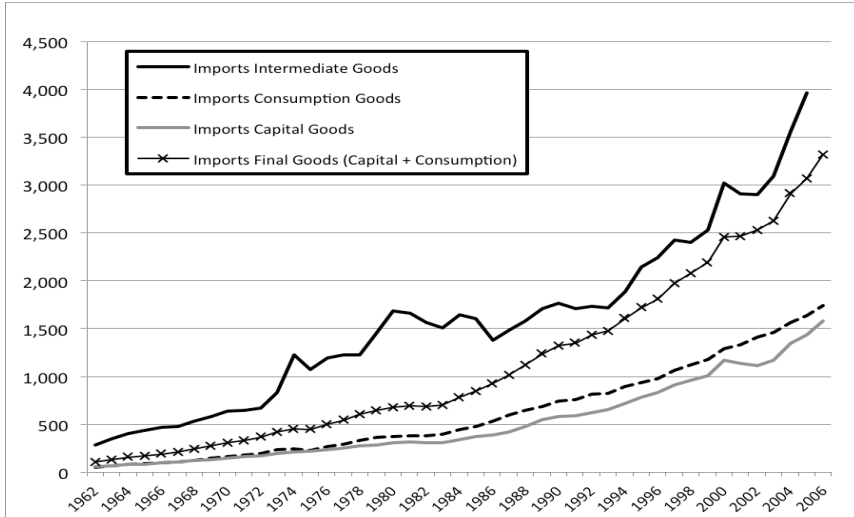
The impact of GVCs can be easy to see on the ground. GVC-mediated trade has clearly driven investments in new productive capacity and massive infrastructure improvements, especially in key producing countries such as China, where we see huge factory complexes, sometimes employing 100,000 workers or more, churning out products that are sent to world markets through vast new port facilities. While little if any of this business or technological competency is likely to be indigenous to the “host” developing countries, it is clear enough that GVCs have boosted employment, enabled increased specialization and larger scale production, driven more efficient geographical allocation of industrial activities, and increased the availability of a variety of intermediate goods in the developing world. As a result, GVCs tend to “compress” the development experience, making non-linear catch up possible, as has been the case in China (Whittaker *et al.*, 2010; Breznitz, 2011).

4. Analysis of Intermediate and Final Goods Trade in the World

This section explains briefly a research that has been done by Sturgeon and Memedovic (2010). They have drawn on the United Nations (UN) COMTRADE database to examine patterns of final and intermediate goods trade. Intermediate goods can be parts and components of manufactured goods for final consumers. Trends in intermediate goods trade are indicative of GVC formation because fragmented production processes require that parts, components, and partially manufactured subassemblies cross borders—sometimes more than once—before final goods are produced and shipped to final markets (Feenstra, 1998; Arndt and Kierzkowski, 2001). They focus on trade in goods because goods-producing industries have been at the forefront of GVC development and, simply put, rich international trade statistics are only available for goods (Sturgeon *et al.*, 2006; Sturgeon and Gereffi, 2010).

A group of data using novel classifications for final and intermediate goods trade, overall; and in three industries oft-cited as being at the forefront of global economic integration has been used: 1) electronics, 2) automobiles and motorcycles, and 3) apparel and footwear.

Figure 1: World imports of intermediate, capital and consumption goods 1962-2006, in Billions of constant (2000) US Dollars



Source: Sturgeon and Memedovic (2010)

Figure 1 shows total world import growth of intermediate, capital, and consumption manufactured goods, as well as a “final goods” category, which combines capital and consumption goods taken together, for the period 1962 to 2006.

According to Figure 1, trade in intermediate goods appears to be much more volatile than trade in either capital or consumption goods. This shows the indication of recessions and business cycles, where slowdowns and downturns impact material, parts and component shipments more than final goods because final goods producers tend to draw down parts of inventories and delay re-ordering during and directly after periods of uncertainty (Escaith *et al.*, 2010). In addition, the growth of intermediate goods trade has been notable after recessions, especially US recessions, but also following bubbles in industries driving GVC development (for instance, the 1985 personal computer bubble and the 2001 “dot.com” or “technology” bubble), crises in regions deeply engaged in GVCs (the 1997 East Asian financial crisis), and worldwide slowdowns (the oil shocks of 1972 and 1979). It can be hypothesized that a

similar reason has followed in the wake of the “great recession” or “financial crisis” of 2008-2009.

Also Chen (2010) has examined the role of intermediate goods in explaining large trade volatility. This topic is of great importance in analyzing the trade collapse in the crisis of 2008 and 2009. In aggregate data, trade volatility is three times greater than GDP volatility, an observation contradicting standard theories. Using input-output tables of the United States data, he identified the importance of intermediate goods in production and distinguished them from final goods. The data showed that the final product trade volatility was dominated by the fluctuation of the intermediate goods trade. Understanding the relationship between final consumption goods and intermediate components can explain why there is high volatility in the trade flow caused by intermediate goods. The final consumption goods producers are trying to deliver goods that customers perceive as being different in ways that are important to them, even if they are producing goods in the same group. Therefore, the production of final consumption goods always involves advertisements, additional accessories, customer services, etc. All these procedures increasing sales and appealing to consumers make final consumption goods imperfect substitute. For example, consumers care about varieties of computers produced by different firms. Computer manufacturers, like Lenovo and Dell, can build laptops with the same specs using quite different designs and materials. They also offer different customers services, technology supports and accessories.

These steps differentiate laptops between manufacturers. Thus final consumption goods are imperfect substitute. By contrast, consumers care less about intermediate goods. Consider the case of laptops. Consumers are more aware of laptops producers than memory or hard disk producers. Final consumption goods are less substitutable than intermediate goods. The production of final consumption goods requires specific intermediate goods produced either at home or in the foreign country. For example, auto manufacturers require components like tires, frames, steels. These intermediate goods are specific and nonexchangeable within the production of a car.

It is well documented that companies tend to be reluctant to hire new workers after recessions, slowdowns, and crises until demand improvements are

sustained, making employment a lagging indicator of recovery (Langdon *et al.*, 2004). Related to this, however, and less well documented, is the more aggressive implementation of outsourcing and offshoring strategies, when expansion resumes, based on a similar reluctance to invest in new internal production capacity and lingering caution from recession episodes of cost cutting and downsizing. This pattern is in line with the findings from qualitative research on the electronics industry, where companies increased outsourcing and offshoring following recessions and technology bubbles in 1985, 1991 and 2001, because demand uncertainty rendered investments in internal capacity more risky. Then, as the cycles continued toward new peaks, firms reported building on successful outsourcing experiences given insufficient time to install new internal capacity to meet rapidly growing demand (Sturgeon, 2003). Overall, in different times, outsourcing and offshoring tended to become more common.

5. Analysis of Iran-China Relations

Iran-China relations are as ancient as the Persian and Chinese civilizations. According to Olimat (2013), their origins extend far back into the era of the Silk Road. The Sassanids of Persia, and the Han and Tang Chinese dynasties had built strong commercial and cultural ties. The Hans signed a commercial treaty with Persia in 100 BCE to organize their trade and customs relations, while Tangs enhanced trade and strengthened their cultural ties with Persia. Since then, trade flourished between the two sides when Silk Road caravans travelled from China across the plains, mountains and valleys of Central Asia towards Persia and through Turkey to Europe's ports. Silk Road merchandise of silk, spices, textiles, horses and camels strengthened relations among world nations at that time and continued its role in promoting trade and cultural exchange well into the thirteenth century.

Olimat (2013) classified the five aspects of Sino (China)-Iranian relations as political cooperation, cultural exchange, arms sales, oil and energy cooperation, and trade and economic relations that are explained as follow:

5.1. Political Cooperation

Persia recognized the Republic of China (ROC) in 1911, signed a friendship agreement with the ROC in 1922 and withdrew its recognition of China in 1949. However, Iran re-established its diplomatic relations with the ROC in 1956 and maintained close political, economic, trade and diplomatic relations.

Relations continued to improve until the Iran Revolution from 1978 to 1979. China had called for peaceful negotiations between the Government and the opposition all along, a process that failed and led to the demise of Shah's regime. China recognized the revolution and attempted to continue normal relations with Iran. Although China did establish diplomatic relations with Iran, its relations with Iran could not be classified at that time as strategic or distinguished. During the 8-years war between Iraq and Iran, China sold weapons to both sides.

After 8-years war, China was delighted that the war had ended, as it was eager for lucrative deals in the postwar reconstruction period and had an interest in the energy sectors in both Iran and Iraq. Iran went to China wholeheartedly, and trade grew rapidly between the two sides.

5.2. Cultural Exchange

Iran-China cultural relations are deeply rooted and embedded within the Silk Road paradigm. Persian culture, musical instrument (lute), religious doctrines (Zoroastrianism, Manichaeism), costumes and traditional folklore were highly celebrated in China, especially during the Tang Dynasty. Familial relationships of marriage and kinship between the two sides were common throughout history as well. These cultural relations began to decline with the Mongol near total destruction of both Islamic and Chinese civilizations. This trend continued through the era of Chinese isolationism and the century of humiliation (1848-1949).

Kemp (2010) states that 'the cultural barriers between the Islamic people of Persia and Buddhists of China, as well as natural barriers such as the mountains and deserts of Central Asia, discouraged trade. Meanwhile, nations encouraged isolationism, which led to xenophobia among their populations, and trade and communications led to the Silk Road dwindled. Olimat (2013) explains contrary

to Kemp's assumption that the incompatibility of the Islamic and Buddhist values contributed to isolationism, Islam was well received in China and celebrated.

Relaxing ideological tensions and improving trade relations led to a significant volume of cultural contacts not only between China and Iran but also between China and the people of the Middle East during the Deng Xiaoping era and afterwards. Cultural exchange is viewed as an instrument to further ties between two sides. In his visit to Iran in April 2002, Jiang Zemin made sure to visit Iran's cultural capital, Shiraz, where he signed a cultural agreement to translate and publish some Iranian masterpieces into Chinese; the project was successfully carried out. Both countries celebrate an 'Iranian' and a Chinese week, assort of annual cultural festival to highlight culture, cuisine, folklore, traditions and bilateral cooperation.

Iran opened the doors of its pavilion to millions of visitors in 2010, Shanghai International Expo. The pavilion fully embodied the traditional Islamic architecture and revealed its glorious ancient art and colorful contemporary lives. It was divided into three parts: Iran's past, present and future. It reflected Iranian civilizational depth, its current developmental accomplishments and its future aspirations. Chinese people also have a tremendous interest in learning Persian. Chinese entrepreneurs are educating themselves in Iranian language, culture and history. Their goal is to equip themselves with the necessary tools to conduct successful business deals with their Iranian counterparts. The Chinese New Year and the Nowruz (Iranian New Year) festivals are frequently celebrated in both countries. They are a testament to the cultural depth between China and Iran. There is also an increase in tourism between the two sides, as Iran is becoming one of the destinations for Chinese tourists.

5.3. Arms Sales

China's arms sales to Iran began in the early 1980s, associated with the Iran-Iraq War, 1980-88. China's weapon shipments sustained Iran and boosted its

ability to counter Iraqi advancements in the war, and eventually turn the tide of the war two years later, in 1982.

Table 1: Iran arms imports from China in millions of dollars from 1987 to 2011

Year	Value in \$ millions	Year	Value in \$ millions
1987	612	2000	71
1988	225	2001	82
1989	68	2002	83
1990	94	2003	86
1991	103	2004	89
1992	98	2005	52
1993	304	2006	71
1994	274	2007	64
1995	58	2008	64
1996	320	2009	64
1997	54	2010	79
1998	70	2011	79
1999	63		
Total	3,227		

Source: SPRI, www.sipri.org

Dittmar and Yu (2010) maintain that, during 1980s, Chinese arms exports to the Middle East ‘had reached an annual average of nearly 87 percent of China’s total arms exports and over 74 percent of total arms agreements, which declined in the 1990s to nearly 32 and 26.5 percent, respectively. From 2000 to 2008, the average share of the Middle East in China’s arms sales stood at about 34 percent, with most of the weapons going to Iran (some 18 percent), Egypt, and Sudan.’ According to Stockholm International Peace Research Institute (SIPRI), table 1 shows Iran arms imports from China in millions of dollars from 1987 to 2011.

5.4. Oil and Energy Cooperation

Chinese-Iranian cooperation in the 1980s was dominated primarily by arms sales, then by commodities and service trade and cooperation in carrying out

major construction projects in Iran such as the Tehran Subway System, then by cooperation in the field of arms sales again in the 1990s, followed by a major concentration on oil and energy. China's early oil importing from Iran goes back to the 1960s, although both countries had no diplomatic relations until 1971. Hameed (2010) states: 'During the first phases of Sino-Iran relations, even though China had oil reserves of its own during the 1960s, it imported 1,393,000 tons of crude oil (100,000 tons per annum), in 1976 it imported 200,000 tons, and in 1977 it imported 300,000 tons from Iran.' After the Iran Revolution, for the period from 1979 to 2000, China assisted Iran in rehabilitating its oil and gas fields. China exported oil technology to Iran which allowed Iran to increase its production capacity. China had also assisted Iran in the maintenance and upgrading of three of its oil refineries as early as 2000, tapping into oil reserves in the Caspian Sea Basin and developing gas fields in the Persian Gulf.

Table 2: Oil and Energy Cooperation Agreement between Iran and China

Years	Agreement Explanation
1960s	China imported 100,000 tons of crude oil from Iran per annum
1976	China imported 200,000 tons crude oil from Iran
1977	China imported 300,000 tons crude oil from Iran
1999	China imported 7.35 million metric tons of crude oil from Iran
2000	China helped Iran in upgrading three oil refineries, tapping into oil reserves in the Caspian Sea
2000	NITC ¹ ordered five giant oil tankers from the CSIC ²
2001	An agreement to exploit the Zavarán-Kashan oil block
2001	An agreement worth \$150 million to upgrade two NIOC ³ refineries
2004	China signed a 25-year deal to import 110 million tons of LNG ⁴ from Iran

1. National Iranian Tanker Company

2. China Shipbuilding Industry Corporation

3. National Iranian Oil Company

4. Liquefied Natural Gas

Years	Agreement Explanation
2006	An agreement including repair, management, and maintenance of the Alborz semi-floating platform in the Caspian Sea with worth \$35 million
2007	Sinopec ¹ signed an agreement to develop the Yadavaran oil field
2008	An agreement to exploit the North Pars gas field by CNOOC ²
2009	An agreement to develop the North Azadegan oil field by CNPC ³ with worth \$1.76 billion over a 29-year period
2009	An agreement to develop phase 11 of South Pars by CNPC with worth \$4.7 billion
2010	An agreement to import an oil rig from China by Iran's NDC ⁴ , for \$143 million

Source: Olimat (2013)

The essence of Sino-Iranian relations is the abundance of Iranian oil and gas reserves, associated with Western withdrawal from Iranian markets due to continued sanctions and renewed sanctions on Iran since the Iraq-Iran War in the 1980s.

5.5. Trade and Economic Cooperation

Wellman and Frasco (2010) have mentioned that China and Iran enjoy an extensive economic relationship. The two cooperate in various different sectors, including energy and construction. China has emerged as a top economic partner of Iran, investing heavily in the energy sector. In 2009, China became Iran's most significant trade partner, with bilateral exchanges worth \$21.2 billion compared to \$14.4 billion three years earlier. In 2011, volume of bilateral trade between Iran and China increased to \$45.09 billion. Figure 2 shows trade flows between Iran and China. The figures confirm the exponential growth in commercial ties between the two countries, which were relatively minimal 17 years prior, when trade volumes amounted to just \$400 million.

1. China Petroleum & Chemical Corporation

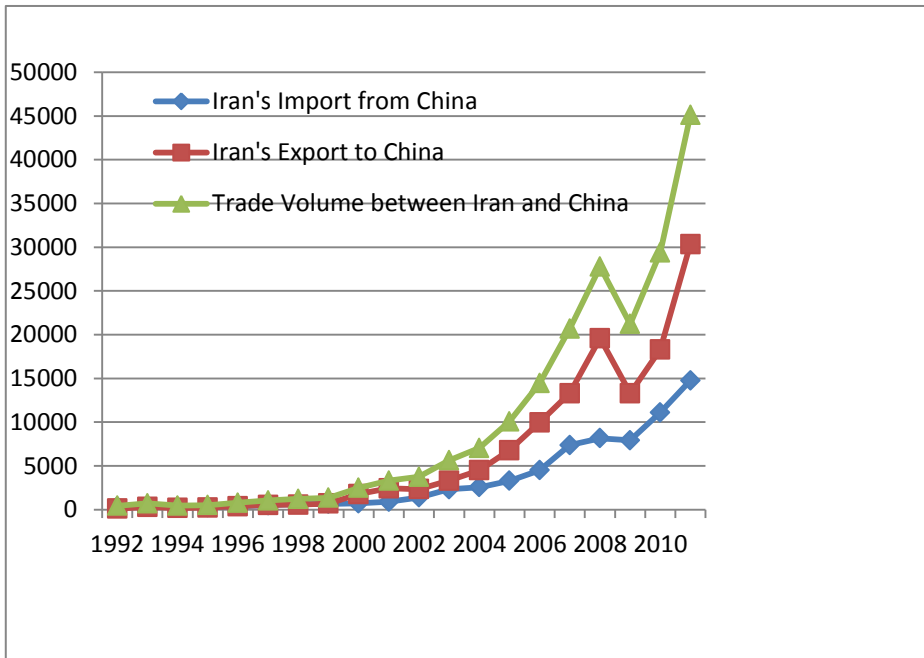
2. China National Offshore Oil Corporation

3. China National Petroleum Corporation

4. Iran's North Drilling Company

According to official data, Iran imported 13% of its imports (\$7.9 billion) from China in 2009. In 2009, China imported \$3.12 billion worth of Iranian non-oil goods, making it Iran's second largest export market. In 2011, this digit increased to \$5.652 billion, making it Iran's largest export market.

**Figure 2: Trade Flows between Iran and China, 1992 – 2011,
Millions of US Dollars**



Source: Author's

For analyzing in details, we have extracted intermediate and final goods trade between Iran and China for three groups of goods: 1) electronics, 2) automobiles and motorcycles, and 3) apparel and footwear. These data are based on UN COMTRADE standard international trade classification (SITC) Rev. 3, five digits for 1992-2011. Table 3 shows numbers of SITC five digits codes and data for three industries in period 1992-2011. Total numbers of SITC code for intermediate and final goods in these three industries is 420.

Table 3: Number of SITC Five Digits Codes and Data for three Industries in Period 1992-2011

Number of SITC Codes		Number of Data in a Year	Total Number of Data in Period 1992-2011
Intermediate Goods	Final Goods		
186	234	840	16800

Source: Authors

Figure 3 shows share of intermediate imports of Iran in these three industries to total imports in three industries from China (SIM). Total imports in three industries illustrate intermediate and final goods imports in these industries. SIM is introduced as:

$$SIM = \frac{\text{Iran's intermediate good imports from China in three industries}}{\text{Iran's total import from China in three industries}} \quad (1)$$

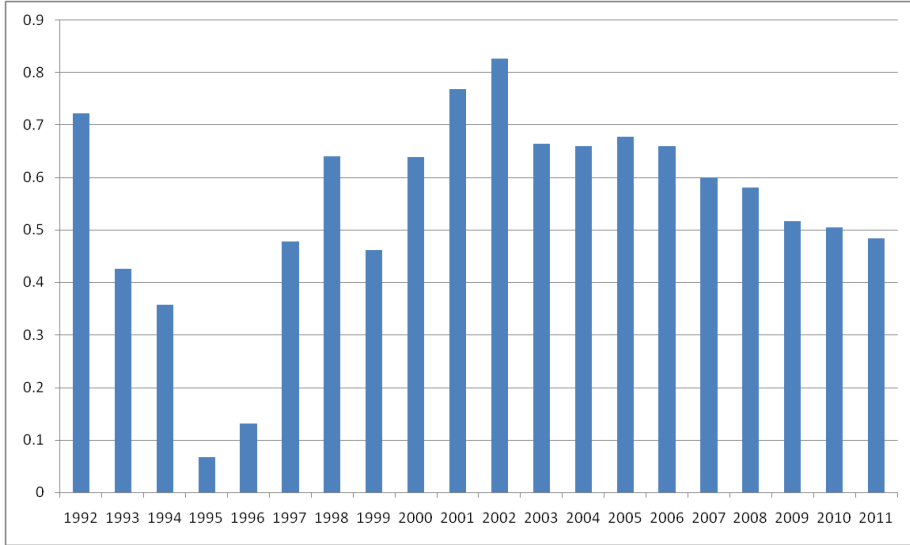
Table 4: Statistical Characteristics for SIM¹, SIX² and SIT³ in the period 1992-2011

SIM			SIX			SIT		
Min	Max	Ave	Min	Max	Ave	Min	Max	Ave
6.74%	82.77%	54.35%	53.47%	99.97%	84.35%	6.9%	82.74%	55.02%

Source: Author's

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1. Share of intermediate imports of Iran in the selected industries to total imports in these industries from China
 2. Share of intermediate goods exports of Iran in the selected industries to total exports in these industries to China
 3. Share of intermediate goods trade of Iran in the selected industries with China to total trade in these industries with China

Figure 3: Share of intermediate imports of Iran to total imports in 3 industries from China (SIM)



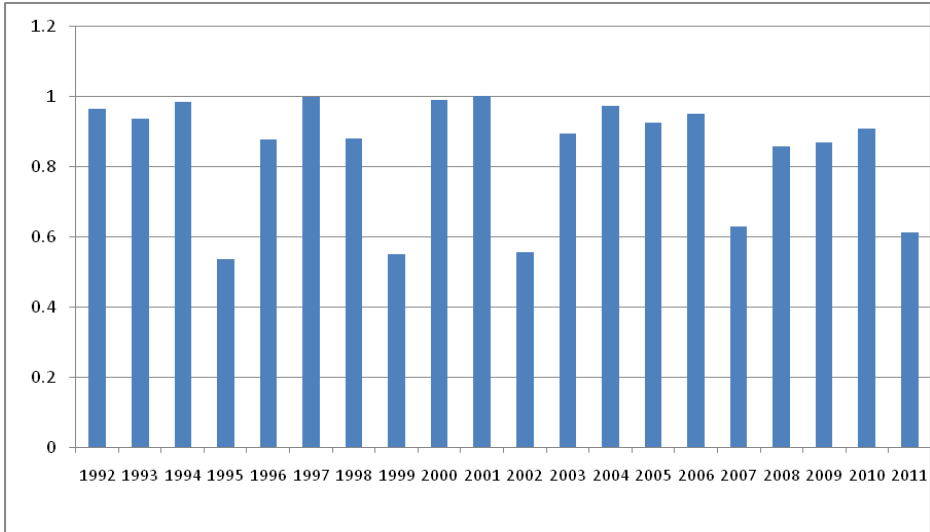
Source: Authors

Figure 3 and Table 4 shows that the lowest share was in 1995 at 6.74%, maximum share in 2002 at 82.77% and the average share has been at 54.35% for the period 1992-2011.

Figure 4 shows the share of intermediate goods exports of Iran in the selected industries to total exports in the selected industries to China (SIX). Total exports in three industries illustrate intermediate and final goods exports in these industries. SIX is introduced as:

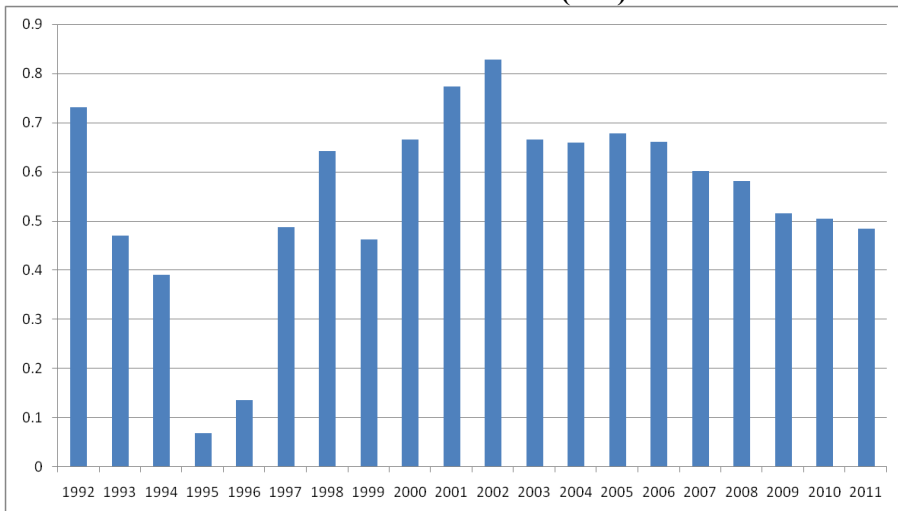
$$SIX = \frac{\text{Iran's intermediate good exports to China in three industries}}{\text{Iran's total export to China in three industries}} \quad (2)$$

Figure 4: Share of intermediate export goods of Iran to total export in 3 industries to China (SIX)



Source: Author's

Figure 5: Share of intermediate goods trade of Iran to total trade in 3 industries with China (SIT)



Source: Authors

Figure 4 and Table 4 show that the lowest share is in 1995 at 53.47%, maximum share is in 2001 at 99.97 and the average share has been at 84.35% for the period 1992-2011.

Figure 5 shows the share of intermediate goods trade of Iran in three industries with China to total trade in three industries with China (SIT). SIT is defined as follows:

$$\text{SIT} = \frac{\text{Iran's intermediate goods trade with China in three industries}}{\text{Iran's total trade with China in three industries}} \quad (3)$$

Figure 5 and Table 4 show that the lowest share (SIT) was in 1995 at 6.9%, maximum share in 2002 at 82.74% and the average share at 55.02% for 1992-2011.

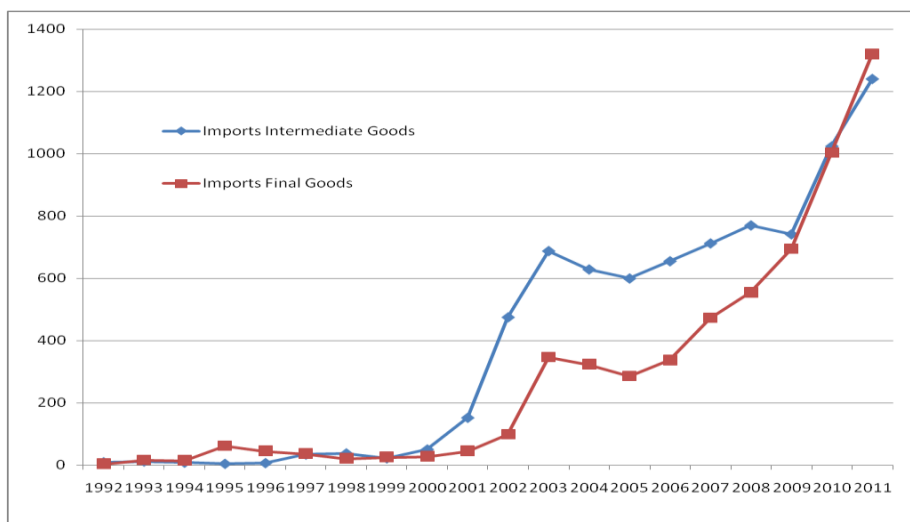
Table 5 shows statistical characteristics of imports, exports and total trade volume in intermediate and final goods between Iran and China in the period 1992-2011. Figure 6 and 7 show trends of these data. As can be seen, standard deviation of Iran's intermediate goods imports from China (400.78) is more than that of Iran's final goods imports from China (367.18). Standard deviation of Iran's intermediate goods exports to China (1.59) is more than that of Iran's final goods exports to China (0.07). Standard deviation of Iran's trade volume in intermediate goods with China (400.28) is more than that of Iran's trade volume in final goods with China (367.18). It means that imports, exports and total trade in intermediate goods between Iran and China have been more volatile than in final goods. These results confirm results that have been reached by Chen (2010) for the US economy and Sturgeon and Memedovic (2010) for the world economy.

Table 5: Statistical Characteristics of Trade in Intermediate and Final Goods between Iran and China, 1992-2011, in Millions of Constant (2000) US Dollars

Types of Goods	Iran's Imports from China				Iran's Exports to China				Iran's Trade with China			
	Min	Max	Ave	SD	Min	Max	Ave	SD	Min	Max	Ave	SD
Intermediate Goods	4.47	1240.65	393.73	400.78	0.123	6.38	1.10	1.59	4.59	1240.78	394.83	400.28
Final Goods	3.65	1321.19	287.09	367.18	0.001	0.293	0.074	0.07	3.67	1321.27	287.16	367.18

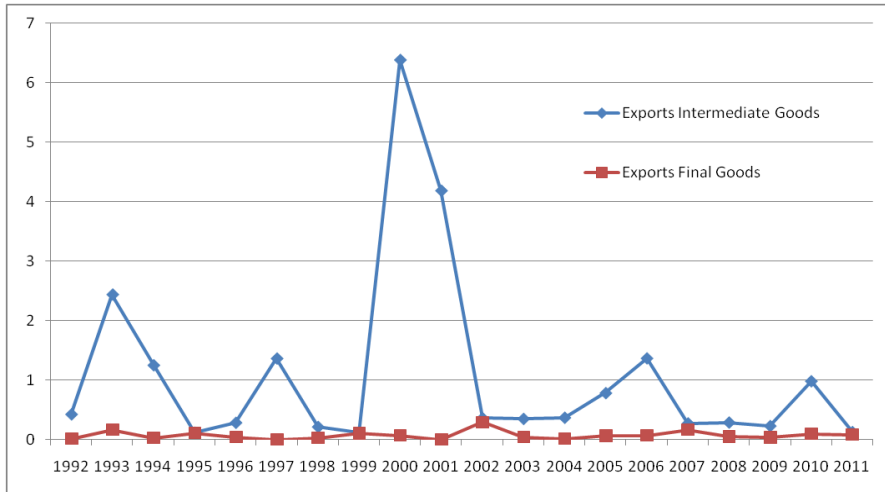
Source: Author's

Figure 6: Iran's imports of intermediate and final goods from China in the selected industries during 1992-2011, Millions of Constant (2000) US Dollars



Source: Author's

Figure 7: Iran's Exports of Intermediate and Final goods to China in the selected Industries during 1992-2011, millions of constant (2000) US Dollars



Source: Author's

According to Table 4, Figure 3 and Figure 4, SIX on average (84.35%) is more than SIM on average (54.35%), but Table 5 shows that average of Iran's intermediate goods imports from China [393.73 million of constant (2000) US Dollars] are more than that of Iran's intermediate goods exports to China [1.1 million of constant (2000) US Dollars] for the period 1992-2011. It means that volume of Iran's international outsourcing to China is more than China's international outsourcing to Iran in the selected industries.

6. Conclusion

This paper has explained different aspects of relations between Iran and China. We have studied structure of intermediate and final goods trade between Iran and China in the period 1992-2011. We have extracted intermediate and final goods trade between Iran and China for three groups of goods: 1) electronics, 2) automobiles and motorcycles, and 3) apparel and footwear. Our calculations showed that Iran's international outsourcing to China was more than China's international outsourcing to Iran.

Empirical results confirmed that imports and exports in intermediate goods between Iran and China have been more volatile than in final goods. These results also confirmed those findings that have been found by Chen (2010) for the US economy and Sturgeon and Memedovic (2010) for the world economy. The implication is that economic situation can be affected more volatility through fluctuation in intermediate trade from the main trading partners.

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